MAY, 1954

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

Air Conditioning Aboard Ships Page 88

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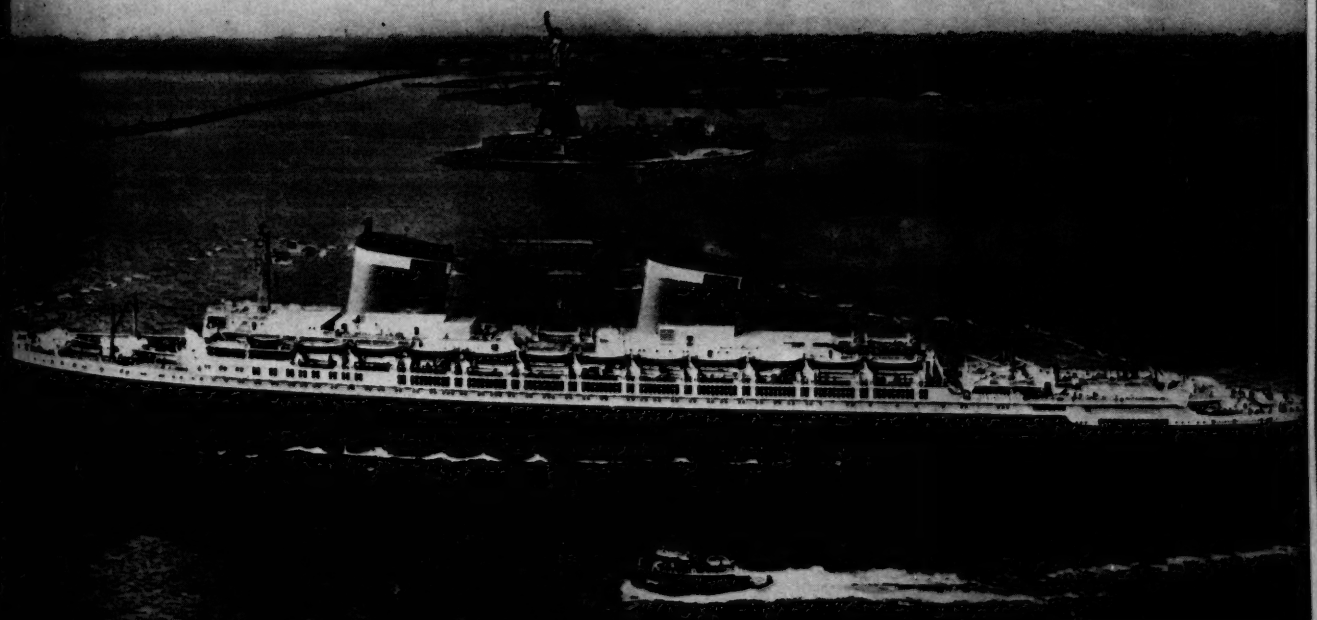
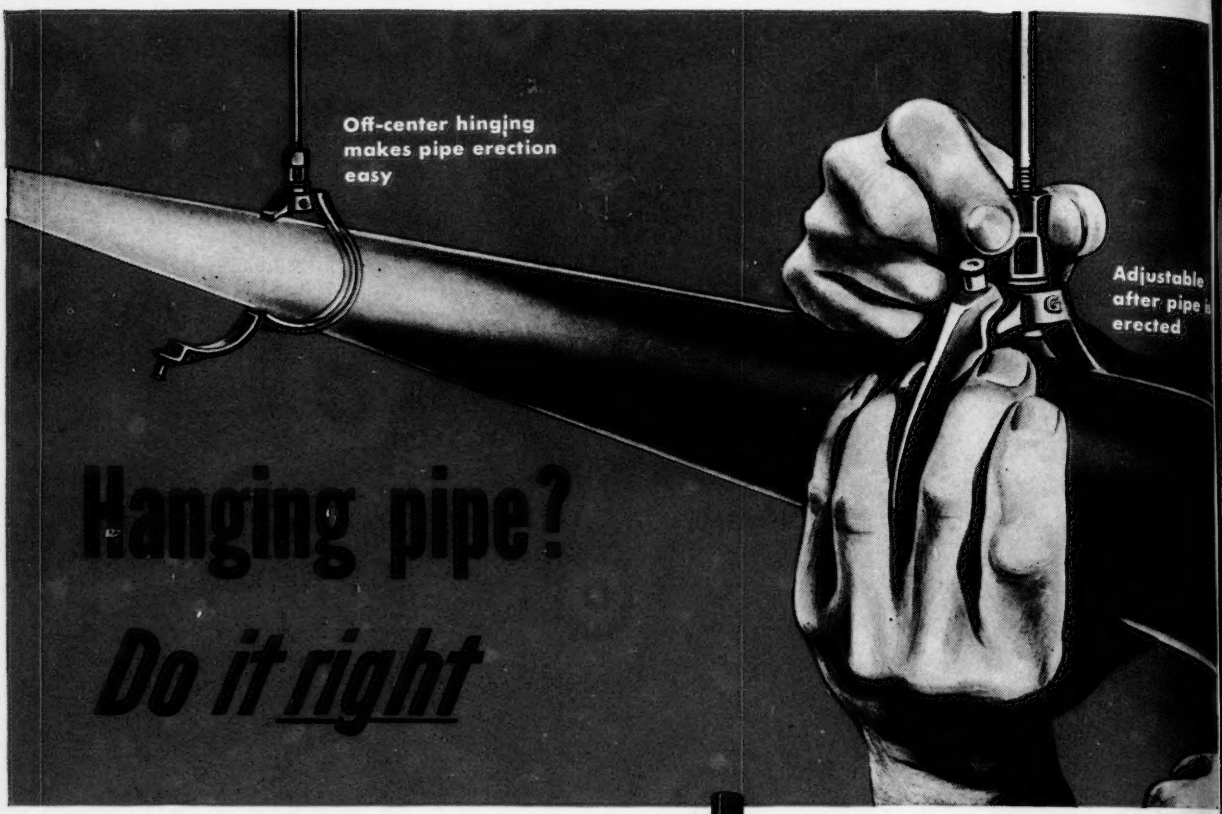




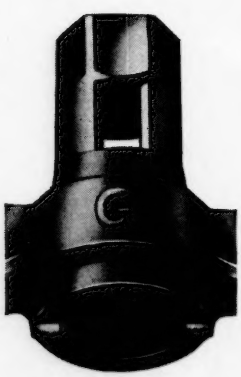
There's a stock Grinnell hanger for every piping requirement

SAVE MONEY ON ASSEMBLY. Cut installation time, get better, stronger installations, with Grinnell adjustable pipe hangers and supports.

NO SAG . . . NO WATER TRAP. Grinnell hangers permit adjustment after pipe is installed. This makes it possible to prevent sagging pipe and water traps, and assures positive drainage for the entire system.

FOR EVERY INSTALLATION. There is a stock Grinnell hanger for every need from simple water pipe to high pressure, high temperature steam line. Where necessary, there is a hanger to compensate for thermal movement.

PLAY SAFE. Don't waste time or take chances on inadequate pipe hangers and supports. All Grinnell hangers comply with rigid piping code requirements.



Enlarged section showing locking feature

GRINNELL ADJUSTABLE SWIVEL PIPE RING
(Split Ring Type)

- Hinging of ring is off-center. This provides sufficient seating to hold pipe before closing ring. Wedge-type pin is loosely but inseparably cast into the hinged section for fastening after pipe is in place.
- To obtain proper adjustment, swivel shank can be turned easily by hand when the weight of the pipe is temporarily taken off the ring.
- When weight is returned, patented swivel shank locks automatically, preventing change of adjustment due to vibration. Wire retaining ring keeps swivel shank and pipe ring or yoke from separating, makes assembly a single unit.
- 12 sizes have load range of 80 lbs. for ¾" size to 1510 lbs. for 8" size. May be used in connection with practically any building attachment.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

TABLE OF CERTIFIED CAPACITY RATINGS

Motor HP	Fan RPM	Tip Speed	Drive	SP 0"	SP 1/8"	SP 1/4"	SP 3/8"	SP 1/2"	SP 5/8"	SP 3/4"	SP 7/8"	SP 1"	Net Wt.
1	1140	8060	DMD	7125	6750	6350	5900	5375	4800	4150	3500	2750	352
1-1/2	1140	8060	DMD	9400	9100		8275	7750	7175	6200	3850	3400	395
2	1140	8060	DMD	10200	9		9025	8575	8075	4450	3600	2900	400
5	1750	12380	DMD	13150							11500	11180	470
			DMD									13650	550

GET ALL THE AIR YOU PAY FOR . . . RIGHT NOW!

Next time you buy or specify roof ventilators, consider their cost in terms of CFM. And for your own protection, ask the manufacturer how he arrives at ventilator capacity ratings.

DeBothezat capacity ratings are the output of the completely assembled roof ventilator, *including the head*. These ratings are obtained from wind tunnel tests conducted in accordance with NAFM Standard Test Code Bulletin number 110, Plate VIA. They conform with U. S. Dept. of Commerce Standard 178-51, which embodies the test codes of ASHVE, NAFM and PFMA.

WHY WAIT?

All members of the Power Fan Manufacturers Association have agreed to begin rating their roof ventilators this way within the next twelve months. You don't have to wait, though. DeBothezat Power-Flow Roof Ventilators are already so rated, and have been for years. Specify DeBothezat NOW and get all the air you pay for.

Send for free catalog . . .

DeBothezat Fans

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American Machine and Metals, Inc.
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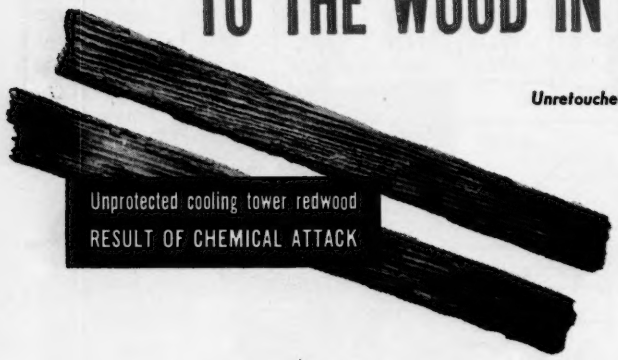
NAME AND TITLE

LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS

Unretouched photographs



Unprotected cooling tower redwood
RESULT OF CHEMICAL ATTACK

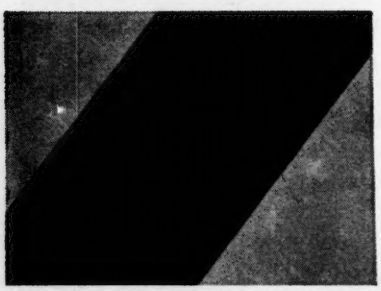
Unprotected cooling tower redwood
RESULT OF FUNGUS ATTACK

PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS

FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING



Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

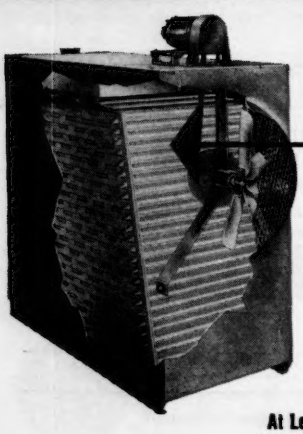
WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack



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Sheet-Steel Cabinets,
5-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Everdur Bolts for ease of
disassembly at any time.

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HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, PLUMBING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

MAY, 1954

VOLUME 51—NO. 5

The Cover: S.S. United States, an example of an air conditioned ship, is shown in the New York harbor. Photograph is through the courtesy of United States Lines.

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Washington News

LORING F. OVERMAN

WASHINGTON is undergoing one of the toughest tugs-of-war noted by Capitol observers in many a year. The reasons are many and varied.

At the top of the heap is concern over the turn of events in Indo-China. On the premise that Indo-China must not fall to the Reds—lest all of south Asia follow suit—the New Look military program is being given a Second Look. There are many in Washington who contend that the idea that a war can be won by dropping a few H-bombs here and there just won't work in jungle fighting.

So there are pleas for expansion of ground forces instead of retrenchment in that field. There are requests for a second look at overseas transport facilities. The OD viewpoint that it can still deliver more defense for less money than has been spent in the past continues. A past President of the United States warns that a balanced budget is a must; yet opposing forces cry for tax reductions which would force the nation's finances further out of plumb.

Amidst all of the uncertainty over the future course of world affairs, Washington is very much in the throes of investigationitis. McCarthy-Cohn vs the Army; Dr. Oppenheimer vs National Security, and the Federal Housing Administration vs untold millions in possible graft.

And over the entire scene is politics—the fact that one third of the Senate and all of the House must run for reelection between now and next January.

Even under ordinary conditions, Washington seethes with cross-purpose activity. Under today's circumstances, it is small wonder that the directional needle of Administration accomplishment spins crazily.

Scandal Slows Housing Bill

Evidence of irregularity in the Federal Housing Administration loan program is considered responsible for delay in passage of the President's Housing Bill. The legislation, already passed by the House, bogged down in the Senate when the FHA scandal came out into the open. This legislation, quite obviously, is of primary interest to heating and ventilating people, for much of the country's record construction total can be traced to FHA-insured mortgaging.

The construction industry has been particularly hopeful that the new housing bill could be hurried through Congress in time for use during the current building season. Reason, of course, is that it provides still-easier terms for housing construction. As passed by the House; the new legislation proposes:

— to allow the Federal Housing Administration to guarantee repair and modernization loans for as much as $3,000 for five years, as compared with the present $2,500 for three years.

— to extend FHA new-house terms to existing houses.

— to reduce down payments and to extend the amount and duration of loans to 30 years for one and two family homes.

— to permit FHA to insure loans to rehabilitate housing in rundown urban areas. This proposal is intended as a substitute for public housing. It contemplates a 40-year mortgage, with $200 down payment on homes up to $7,600 (or $8,600 in special areas), for families displaced by slum clearance.

Meanwhile, the very improvement which the new housing bill seeks to make in the construction picture is the subject of FHA scandals. Congressional investigators are digging into two angles. One is the alleged fleecing of home owners on over-priced home improvements financed by FHA loans. The other concerns so-called wind-fall profits picked up by builders of apartments under the 1942-50 emergency rental housing program.

Although it is expected that the investigation will continue for weeks, possibly months, it seems likely that the new housing legislation will be hurried through Congress, with appropriate safeguards added.

Construction Outlook Good

Assuming the early completion of housing legislation, the construction outlook is extremely favorable. Through March, the number of privately financed housing starts reached 232,000—only 6,000 units below the same period of last year. Most serious obstacles to the sale of new houses is the large down payment required in most cases. Another is the difficulty in selling old houses, again largely because of the high down payment.

The pending housing legislation is intended to correct these conditions, among others, and Congress knows that some of the Administration's plans for prosperity start with a healthy housing industry.

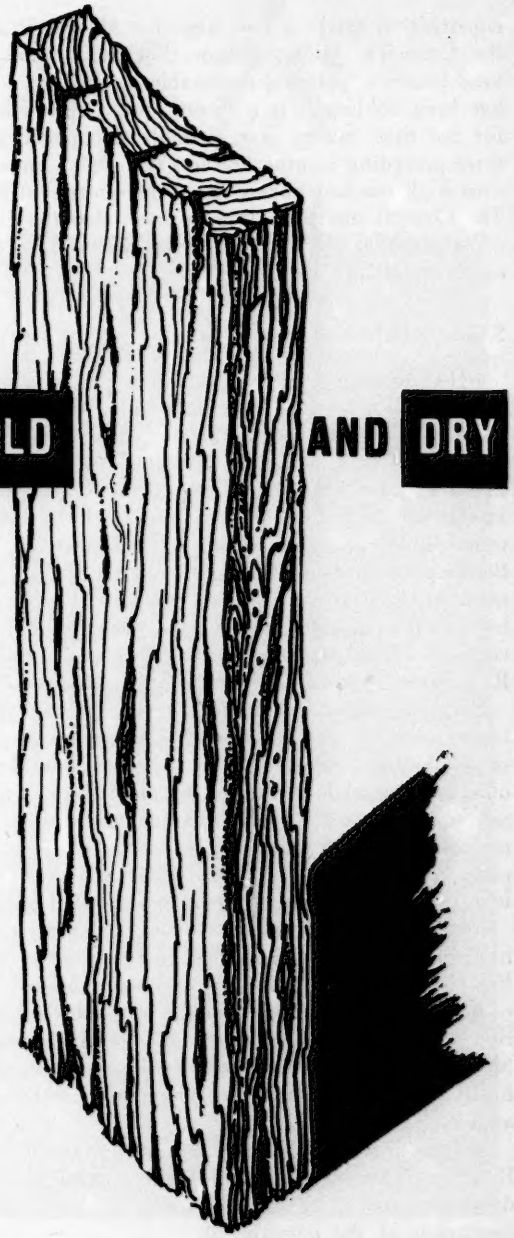
Meanwhile, private surveys being circulated in Washington indicate that manufacturing industries are planning to spend as much on plant and equipment in 1954 as they did last year. The estimated total for the year is $12.4 billion this year for plant and equipment, compared with $12.3 in 1953.

Based on studies through February and early March, the total estimated for manufacturing construction is placed at a somewhat lower figure ($11.41 billion), by the President's Council of Economic Advisers. The Council's April report (No. 7) estimates that business expenditures for construction and equipment for the year will total $27.2 billion. Included are the following estimates: Transportation $1.40 billion, public utilities $4.43 billion, commercial and other $8.01 billion, and manufacturing $11.41 billion. Estimated for mining is a total of $1.04 billion.

Pace of Downturn Slowed

The President's Council of Economic Advisers also reported that although a downtrend of economic activity continued for eight months, the pace appeared to be slowed. The factors showing declines included production, industrial employment, and income. Industrial output is now down more than 10% from the peak of last July. The factory job total was reported as the lowest for any month during the last two years while total income before taxes has also declined. Sole bright spot is the

WOOD WON'T ROT WHEN IT'S COLD AND DRY



Living fungi, which break down the substance of wood are microscopic and abundant. But they need WARMTH and DAMPNESS to develop. Dampness will also peel off paint, crumble plaster, cause iron and steel to rust.

Some insulations can promote and retain destructive condensation inside walls and other structural spaces. Warmth and vapor can flow through asphalt, paper, plaster and most building materials, including ordinary insulations. Vapor condenses when, upon striking a colder surface, the air reaches a dew-point.

An empty space, the best insulator against heat flow by Conduction, does not prevent heat flow by Radiation and Convection. Of all heat transferred through structural spaces, about 50% to 80% is by Radiation; all but about 7% of the rest is Convection. The surfaces of multiple accordion aluminum sheets have a reflectivity for heat rays of 97%; absorptivity and emissivity of only 3%. The aluminum and fiber layers retard Convection. Conduction is slight through the preponderant low density air spaces.

The tough aluminum sheets used in multiple accordion aluminum are impervious to water vapor, and are long and continuous. Infiltration under flat, stapled flanges is slight.

Where multiple accordion aluminum is used, fortuitous vapor and water (for instance rain) which intrude into wall and similar spaces will gradually flow out as vapor through exterior walls and roofs as pressure develops within, because vapor flows from areas of greater to less density. The vapor cannot back up through the continuous, impervious aluminum, so it flows out because exterior walls and roofs have substantial permeability in comparison with aluminum, far greater than the required 5 to 1 ratio.

To obtain maximum uniform depth protection against heat loss and condensation formation, it is necessary to use **edge-to-edge** multiple aluminum, **each** sheet of which automatically stretches from joist to joist.

The U.S. NATIONAL BUREAU OF STANDARDS brochure: "Moisture Condensation in Building Walls," discusses vapor and heat flow, and the causes and prevention of condensation. Use the coupon. Get a copy at our expense.

*Patent applied for

COST OF EDGE-TO-EDGE MULTIPLE ALUMINUM INFRA INSULATION installed in new construction between wood joists, material with labor

Type 6-Si under 9½¢ sq. ft.

Type 4-Si under 7½¢ sq. ft.

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construction total—a new high for March. In addition, the Council's estimates show that despite the drop in total income, "personal disposable income" of consumers has been holding near a record rate. Disposable income for the first quarter was virtually unchanged from the three preceding months, and less than 0.5% under the all-time high reached during the third quarter of last year. The Council interprets this to mean that the cut in income taxes at the start of 1954 has offset declines in employment and working hours.

Smoke Abatement Plan Studied

FHA financing for smoke-abatement facilities, together with a 5-year amortization privilege, is proposed in an amendment which Senator Capehart (R., Ind.) planned to tack onto HR 8300, the tax revision bill. Plans for the FHA financing are also included in an amendment to S 2838, the omnibus tax bill which underwent public hearings during April before the Senate Banking Committee, of which Senator Capehart is chairman. At the hearing, testimony favoring both the financing and the tax amortization was given by smoke control engineers from Detroit, Northampton, Pa.; Providence, R. I., New York City, and Evansville, Indiana.

Speaking for Northampton, Irving W. Coleman, attorney, told the committee of his community's problems in combatting industrial dust from cement plants and other commercial operations in the Lehigh Valley. He said that the cost of installing facilities, which are expensive and do not contribute to the efficiency of the plant, are the chief obstacle to smoke abatement. Federal loan insurance and tax amortization should help, he said.

Benjamin Linsky, smoke inspector for Detroit, said his community has a good law and is making progress. Principal problem, he said, is the development of means of handling types of gas or smoke for which no precipitation processes have been developed. He said research features of the amendment are of most importance to Detroit, but that tax amortization and financing would help other areas.

Austin C. Daley, air pollution engineer, Providence, R. I., said that his community suffers millions of dollars damage to paint and stone buildings annually. He urged enactment of the amendment.

New York has a good ordinance and a good smoke abatement program, according to Leonard Greenburg, M.D. and graduate engineer, but prevailing winds bring industrial smoke and dust from other states.

Estimated annual damage from smoke is $600,000 in Evansville, Ind., according to John Clausheide, smoke commissioner. The program has reduced smoke damage to 30% of the 1949 level, but financing is the chief obstacle to completion of the program.

Atomic Eenergy Legislation

With atomic energy becoming increasingly important to all industry, and particularly to those in the fields of heating, ventilating and air conditioning, the new Administration bill for the industrialization of that resource is worthy of note. The Administration bill (HR 8862) has been introduced in the House, to authorize industrial participation in atomic energy and international exchange of restricted data.

Typical of the scope of the industrial-atomic energy program is a new project approved by the Atomic Energy Commission. It authorizes further power reactor studies by a research group including 26 associated firms or groups of firms which have been investigating nuclear power technology since 1951. Under the new authorization, the group will spend about $2.3 million in research and development on a breeder reactor for the generation of electric power. Most of the expenditure will be for industry-owned research facilities, but, when projects under study require, AEC facilities may be used.

Washington Miscellany

Unemployment Tax Proposal. Of possible interest to heating and ventilating people not previously covered by unemployment compensation systems is a new bill (HR8857) introduced by Representative Daniel Reed (R-NY), chairman of the House Ways and Means Committee. The Reed Bill would bring into the system all establishments in industries presently covered, but which employ one or more persons. Present legislation exempts firms having fewer than eight employees. Mr. Reed estimated that the legislation would cover an additional 3.4 million individuals.

Pipeline Need Outlined. For national defense purposes, it is more important to have oil pipeline transportation to the East Coast than to the West Coast, the Defense Department has indicated. The department's viewpoint is voiced in a letter from Charles S. Thomas, Assistant Secretary of Defense for Supply and Logistics, to Deputy Petroleum Administrator Joseph A. LaFortune.

The PAD had asked the Defense Department for its position on the essentiality for national defense purposes of a proposed crude oil pipeline from West Texas to California. The Office of Defense Mobilization has been asked for a certificate of necessity—a requirement if special arrangement is to be made to amortize the pipeline cost over a five-year period.

Says the Thomas letter:

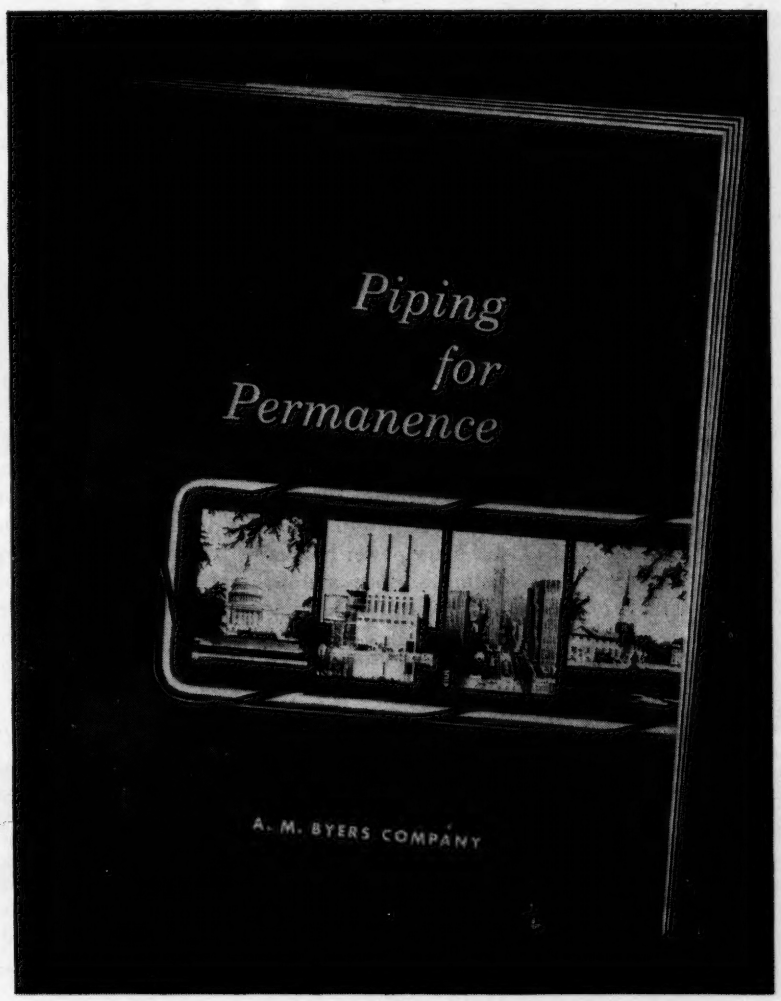
"It has been concluded that a crude oil pipeline from West Texas to California would contribute to the national security and would have strategic and logistic significance in time of war. However, it has been further concluded that the need for pipeline transportation of crude oil to the East Coast in time of war far outweighs the need for such transportation to the west Coast."

Production Pools Criticized. Heating and ventilating folks were not alone if they found production pools ineffective as a means of securing defense contracts during the Korean war. The pools were arranged to permit small contractors to join forces in going after defense work. Attorney General Herbert Brownell, in a report to Congress and the President, questioned whether the pools can be successful at all under present conditions or legislation.

According to his report, there were 26 production pools during the Korean war, with a membership of 576 companies having 27,725 employees. A total of 206 prime contracts went to 10 of the pools, with 160 going to a single pool. Sixteen of the pools reported no success in landing cntracts, and 18 reported expending $425,000 to get business. Total business assigned to pools reached $5.4 million as of December 31, 1953, but this included $2.7 million in a single contract which has been terminated by default of the production pool.

Your copy is ready

...PIPING FOR PERMANENCE



The nature of piping problems in heating and plumbing systems, and the methods by which they can be solved, are discussed in detail in this 32-page Bulletin.

Prepared by our Engineering Service Department, this Bulletin is based on the information we have gathered from analysing complete data on thousands of piping installations of every type, under all kinds of conditions. This pool of experience has been condensed between covers in a clear, easily followed story to help you realize greater piping economy in your installations.

The bulletin also includes a roundup of wrought iron pipe installations from every part of the country and presents practical evidence of the results obtained from the use of the material. These past service records are providing leading engineers everywhere with a practical guide for today's selection.

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Requisites of a piping system—brief review of piping material properties essential to long-life, economical service.

Building-piping systems—definition of individual services; brief discussion of conditions that threaten service life in plumbing and heating systems and solutions; fundamentals of design and installation that may be used to reduce the rate and severity of corrosion.

Water and water problems—background facts on interpretation of water analysis and water treatment.

How Byers can help you—available data on piping installations to solve individual problems; how you can benefit from the records of our Engineering Service Department.

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CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

BRIEFLY STATED

• Howard M. Fitch, general manager of the Herman Nelson Division, Moline, Ill., has been elected a vice president of American Air Filter Company, Inc., Louisville, Ky. Joining AAF as a sales engineer in June, 1936, Mr. Fitch served as production manager, manager of the legal and patent department, and assistant to the executive vice president, before becoming manager of the Herman Nelson Division in 1953.

• The first Anthracite Industry Commercial Equipment Show closed April 1st to make way for a showing of new domestic anthracite heating units at the Architects Building, 101 Park Avenue, New York City. The new exhibit features automatic vacuum ash removal systems and the application of new automatic anthracite burners with home air conditioning systems.

• New orders in 1953 for steel power boilers of 100 square feet of heating surface and over, totaled 5,608 units with total heating surfaces of 9.4 million square feet, according to the Bureau of the Census, Department of Commerce. In number of boilers, the 1953 total represented a decrease of 4% from 1952, and in terms of heating surface, a decrease of 26%. New orders booked during 1953 included 5,573 stationary power boilers with 9.2 million square feet of heating surface and 35 marine boilers with 197 thousand square feet of heating surface.

• Methods of storing low-rank coals in the open for long periods without spontaneous combustion or significant loss of heating value are described in a Bureau of Mines report, R. I. 5034. Sub-bituminous coals and lignites, prone to spontaneous combustion during storage, are the most reactive coals but can be stored satisfactorily on the surface if segregation of sizes is avoided and storage piles are thoroughly compacted, stopping air circulation. Attempts to keep air out of storage piles by sealing them with asphalt and by banking them with earth proved ineffective when sizes of coal were allowed to become segregated and compaction was either omitted or inadequately done.

• A. J. De Fino, vice president, Fedders-Quigan Corporation, Buffalo, New York, was elected President of the Air-Conditioning and Refrigeration Institute at its Annual Board of Directors Meeting held at The Greenbrier, White Sulphur Springs, West Virginia, on April 1. He succeeds L. C. McKesson, vice president in charge of sales, Ansul Chemical Company of Marinette, Wisconsin. James Emmett, Jr., vice president, Jas. P. Marsh Corporation, Skokie, Illinois, was elected Vice President. M. M. Lawler, vice president, Worthington Corporation, Harrison, New Jersey, was elected Treasurer.

• Fred J. Watt has been named manager of a newly combined section of Worthington Corp.'s Air Conditioning and Refrigeration Division at the corporation's Harrison, N. J., executive offices. Mr. Watt assumed his new duties April 1 as head of the new section known as the Central Station and Ammonia Equipment Section. Mr. Watt joined Worthington in 1936 to head up Air Conditioning for National Accounts.

• Robert C. Cross has been appointed chief engineer of Kritzer Radiant Coils, Inc. Mr. Cross was associated with Sears Roebuck where he was assistant manager of the Merchandise Testing and Development Laboratories.

• Richard E. Ireland, a 17-year employee with Janitrol Division of Surface Combustion Corp., Columbus, Ohio, has been appointed sales promotion supervisor.

• Lewis R. Smith has rejoined the engineering staff of Acme Industries, Inc., Jackson, Mich., manufacturers of air conditioning and refrigeration equipment, where he will direct a research and development program. During his previous tour of duty with Acme, 1936 to 1944, Mr. Smith was a prime factor in the development of many well-known Acme products. He recently resigned from Remington Corp.

• The Naval Ordnance Laboratory has announced the development of Thermenol, a high temperature alloy of non-critical metals, showing promise as a substitute for certain stainless steels in many applications. Thermenol is a modification of the magnetic material, 16-Alfenol which was developed in the NOL Magnetics Division as a non-critical "soft" magnetic material. Metallurgists working in the laboratory found that by making small additions of such metals as vanadium or molybdenum, coupled with suitable heat treatment, the heat resistance of the alloy was increased, and a new group of heat resistant alloys resulted. Thermenol is one member of this family. Thermenol is 20-25% lighter than stainless steel and its physical characteristics include a high tensile strength coupled with a high resistance to corrosion or oxidation.

• Ladish Co., Cudahy, Wis., manufacturers of seamless welding pipe fittings and forged steel fittings, has announced the acquisition of the assets of the Tri-Clover Machine Co., Kenosha, Wis., by purchase of its capital stock. Tri-Clover will operate as a division of the Ladish Co. and will continue to make high alloy and stainless steel light weight corrosion resistant pipe fittings, valves, pumps, and specialties to serve the dairy, chemical, food processing, pharmaceutical and paper industries.

• The Marley Co., Kansas City, Mo., has built a new plant in Louisville to manufacture mechanical draft cooling towers. The new plant provides 77,000 sq. ft. of production space.

• Key appointments to the staff of the Westinghouse Electric Corporation's new Air Conditioning Division are: William B. Cott, sales manager; John L. Ditzler, engineering manager; Clifford M. Sayre, manager of manufacturing; Charles E. Smoyer, Jr., manager of accounting; Harold L. Goehring, industrial relations manager; and John C. Feick, Jr., purchasing agent. The six men have an aggregate service record of 98 years with Westinghouse.

• Eldon E. Fox, advertising manager of Minneapolis-Honeywell Regulator Company, has been named chairman of the advertising committee of the Producers' Council, Inc., national organization of building products manufacturers. He succeeds Ray Dodge of the Kawneer Company of Niles, Mich.

ONE OF A 75th ANNIVERSARY SERIES...

design LEADERSHIP

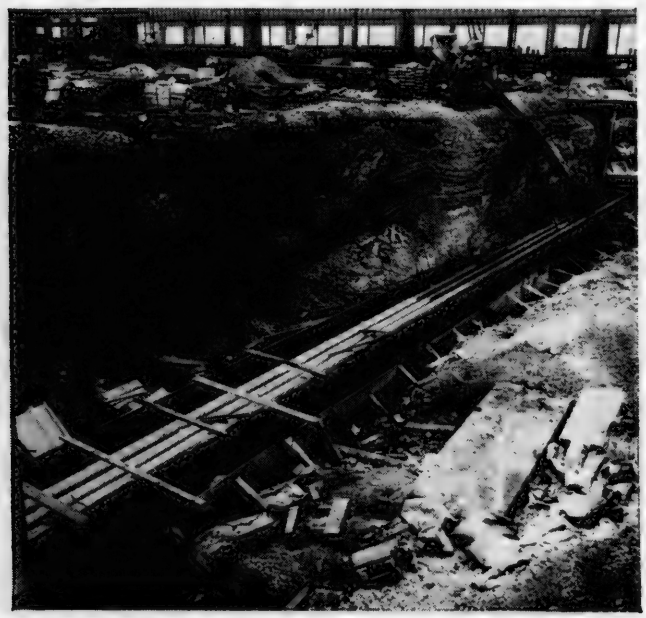
Distinguished by a sleek, clean lined appearance, the DELANY No. 50 Vacuum Breaker for flush valve use is completely individual in its interior design. Pioneering the departure from swing check type vacuum breakers, the No. 50 introduced the era of the expanding rubber sleeve as replacement for the troublesome metal hinged flapper. The ever present hazard of a mechanical check sticking in the open position due to wear or harsh water conditions is eliminated by the use of the No. 50. Easily repaired and adaptable to any flush valve, the No. 50, unlike former types, telltales the slightest defect by water spillage — insuring health protection always. Now generally regarded as leader in its field and often imitated, the DELANY No. 50 is fully protected by basic patents. For more detailed flush valve and vacuum breaker data contained in Handbook and Catalog 53, write Engineering Department, COYNE & DELANY CO., 834 KENT AVE., BROOKLYN 5, N. Y.

DELANY-*the fastest growing name in flush valves!*

NO JOB TOO TOUGH

SIMPLE SYSTEM. Easy-does-it! Typical Z-crete installation on 2-pipe system. Chute carries material into the forms. Light puddling assures a complete filling of forms.

COMPLEX SYSTEM. A large steel mill makes an easy protective job of insulating 12 pipes in one conduit. Included were H.P. steam, steam traced oil lines and other utilities.



From the Simplest to the Most Complex Pipe System

"Z"crete

THE MODERN MONOLITHIC INSULATION

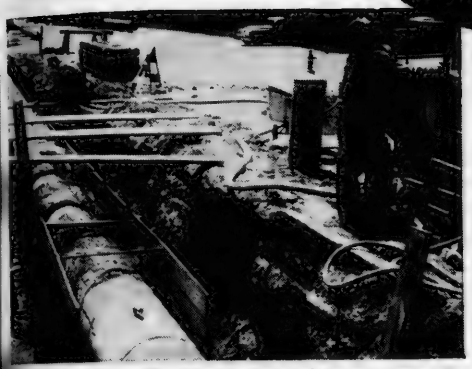
Insulates Underground Heated Piping Easier, Economically, Permanently

Z-crete handles those tough jobs with *ease*. matter what the pipe size or arrangement, Z-c (because it's poured) forms a permanent, mo lithic protection around one pipe or a dozen without joints or voids. Z-crete is made of i ganic, rotproof insulating concrete...poured the field—monolithic—restricts water movem around the pipe assembly. You'll find Z-crete usually the most economical of all systems install...Miles upon miles of Z-crete have b *successfully* installed in *all* types of soil...even steepest grades.

Z-CRETE *can help solve YOU tough insulation problems, too! Specify* **Z-CRETE**

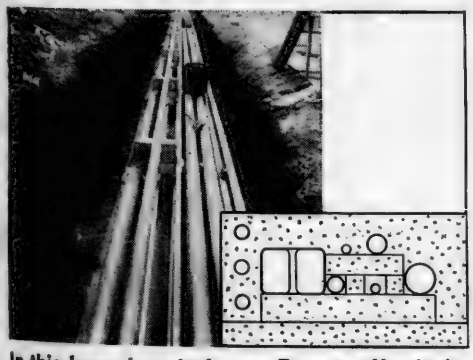
SEND FOR FREE BOOKLE

FOR "Z" crete®



No pipe too small or too large to be insulated with Z-crete. Here in city streets a large utility installs a monstrous 30″ low pressure steam supply and 10″ return pipe. Both pipes are contained in a single Z-crete conduit.

A large tank farm pipe assembly insulated with Z-crete on grade. Some of the large Z-crete conduits are used as walkways. On several occasions area has been flooded with no harmful effect on permanent, efficient Z-crete.



In this large hospital area Z-crete effectively insulates the complicated piping system between all buildings. Special support block shapes can be manufactured to meet special needs. Z-crete conduit is in effect a supporting pipe sleeve.

these actual photographs show how Z-crete is solving the toughest job problems

What other insulation for underground piping offers all these superior advantages

★ **MORE ADAPTABLE**—Z-crete is a field fabrication. Piping contractor has an easy-to-work-on concrete base pad for installing pipe. Pipes are installed—*then* insulated.

★ **MORE ECONOMICAL**—Low in cost, provides permanent and stable insulation. Especially economical in large-pipe or multiple-pipe installations.

★ **MORE EFFICIENT**—Z-crete's monolithic pour eliminates heat loss due to air movement. Six inches of insulation around pipe provides PLUS insulation value.

★ **PERMANENT**—Will not rot or deteriorate...water can't flow through Z-crete. Resilient, completely fire-proof.

★ **READILY AVAILABLE**—Z-crete materials are readily available from our many strategically located plants throughout the United States and Canada. Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U.S. Patent No. 2355966 —Canadian Patent No. 439356. There is an applicator near you.

Many conduits are reinsulated with Z-crete. On this job water had ruined sectional pipe covering insulation. Pictures show before and after reinsulation. (Special pump equipment makes possible reinsulation with minimum of excavation.) It is economical to reinsulate in this manner if piping is good but insulation has deteriorated.

"Z" crete

DIVISION
Zonolite Company

Write for FREE Booklet

Zonolite Company, Dept. HV-54
135 S. LaSalle St., Chicago 3, Ill.
Please rush free Z-crete Booklet Z-11 with full details about this easier, better insulation of underground heated piping.

Name.....

Address.....

City.....*Zone*....*State*.....

NOW! the new Modine

A modern room unit for cooling and heating hotels, apartments, motels, offices, hospitals, schools, homes. Ideal for new construction and modernization.

THE new Modine AIRditioner* provides cooling with chilled water, heating with hot water . . . filters, dehumidifies, circulates and introduces fresh outside air. All functions are subject to individual room control. Here is healthful summer-winter comfort for multi-room installations within reach of the most modest air conditioning budget.

Modine AIRditioner design assures excellent performance on cooling or heating plus unusually quiet operation. Four-speed motor control provides maximum flexibility in meeting comfort requirements.

Choose from four types: The beautiful Console (illustrated) for exposed or partially recessed installation . . . the Concealed . . . and the Overhead types with and without casings. Each type is available in three sizes rated at 2/3, 1-1/2 and 2 tons of refrigeration (220, 440 and 640 cfm respectively).

Distinctive appearance and versatility are combined in the Console type styled by Jean Otis Reinecke, nationally known designer. This unit may be installed against a wall—or recessed to a depth of 5 inches, leaving less than 6 inches exposed in the room. Use of square edges at junctions of top and sides eliminates need for cutting rounded contours in wall recess . . . or preparing specially formed trim strips. Square edges blend gracefully into rounded corners in forward part of top.

Modine AIRditioners are Parker-Bonderized and finished in a semi-gloss Marine Green primer selected for high resistance to humidity. The factory finish is so attractive that further decorative treatment will frequently be unnecessary.

*Trademark

Access doors are provided on both ends of unit to allow reversal of motor control location. Alternate door usable for water-flow or other controls.
High-capacity coil has brass tubes, electro-plated for protection against electrolysis with aluminum fins. All tube-joints are brazed. Coils are reversible for right or left-hand piping connections.
Outlet grill is integral part of 18-gauge cabinet top. Adjustable louvre grill optional at extra cost.
Manually adjusted fresh air damper for regulation of fresh and recirculated air mixture.
Quiet operation is assured by ample use of glass fiber insulation plus sound-deadening mastic throughout. In addition, fans and motor are resiliently suspended.
All electrical connections within cabinet reversible.
Air filter readily removed for cleaning or replacement. Access to filter by manually removable front panel. No tools needed.
Motor and fan assembly easily removed as unit by taking out four bolts and disconnecting electrical plug.

CONSOLE TYPE WITH FRONT AND END PANELS REMOVED

Modine AIRditioners

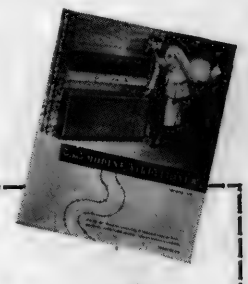
AIRditioner

(Above) Console type is installed against finished wall. A ⅜-in. thick sponge rubber strip around perimeter of back serves as wall seal and as plenum for fresh air inlet. All piping and wiring are concealed in enclosure.

(Left) Because all rear corners are square, AIRditioner can be recessed faster, at lower cost. With over-all depth less than 11 in. and up to 5 in. of recessing permissible, AIRditioner takes far less floor space.

Concealed and Overhead Types

Other AIRditioners available include: Concealed type for built-in installation behind a finished wall. Overhead type with casing for exposed ceiling installation. Overhead type without casing for use with ducts above a false ceiling or in a closet.



MODINE MANUFACTURING COMPANY
1511 DeKoven Ave., Racine, Wis.

Please send me a free copy of bulletin describing the new Modine AIRditioner.

Name .....

Position .....

Firm .....

Address .....

City ..... Zn ..... State .....

A-1223

There is a difference in return bends—

Making a seamless return bend is no simple task. Holding it to the unvarying accuracy and metallurgical uniformity found in 180° WeldELLS® is a feat that could be accomplished only by the organization that pioneered the seamless return bend and perfected it through a quarter century of specialization.

Every WeldELL return bend gives you exactly what you ordered: true roundness, accurate size, full pipe thickness from end to end . . . controlled quality all the way through. No fitting tells the WeldELL story better than the return bend. There IS a difference!

And there *IS* a difference in *all* Taylor Forge Welding Fittings. It is a difference that is particularly important now that fittings made to low standards have come into the market. Today the best way to be sure you are getting welding fittings of highest quality, conforming to all codes and standards, is to specify Taylor Forge WeldELLS.

WeldELLS—the *first* complete line—is still the *most* complete line, in range of types, sizes, weights, materials. For up-to-the-minute facts see your Taylor Forge Distributor.

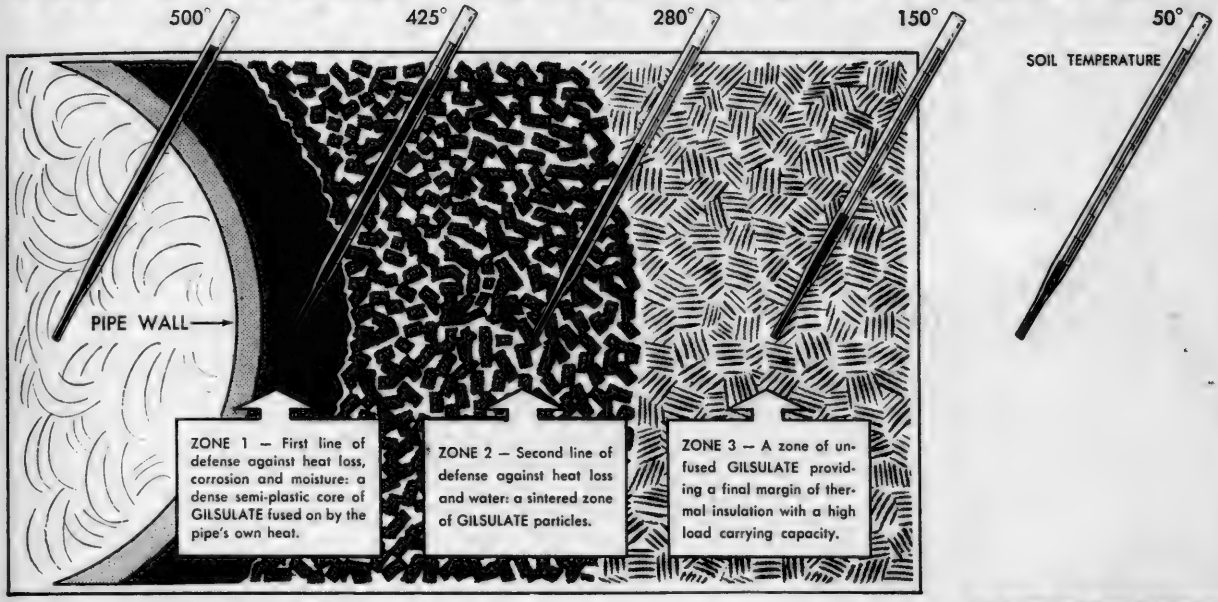
TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill.

Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ont., Canada

Lowest Cost

PER INSTALLED LINEAR FOOT OF ANY HOT UNDERGROUND PIPE INSULATION


500°
425°
280°
150°
50°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — First line of defense against heat loss, corrosion and moisture: a dense semi-plastic core of GILSULATE fused on by the pipe's own heat.
ZONE 2 — Second line of defense against heat loss and water: a sintered zone of GILSULATE particles.
ZONE 3 — A zone of unfused GILSULATE providing a final margin of thermal insulation with a high load carrying capacity.

GILSULATE®... the triple-zone insulation that fuses itself into lifetime protection for hot underground pipes. Water-proof, corrosion-proof, root-proof, acid/alkali-proof.

Compare your present insulation methods with Gilsulation:

1. Pour Gilsulate granules out of the bag onto the pipe; tamp it down.
2. Backfill: *the job is insulated!*

Gilsulate—nature's own insulation—is a unique, solidified hydrocarbon that virtually installs itself. Normal pipe-heat (up to 520°F) does the rest—fuses the Gilsulate to the pipe in hours, forming a massive circular solidified sheath.

Gilsulate costs less installed per linear foot *than any other underground pipe insulation*... it's easiest to use... and has been tested in scores of the country's largest and most important installations.

Some additional Gilsulate advantages:

- *3 grades available*—220° to 520° F
- *needs no sleeves* or mechanical sheaths
- *requires no mixing* or special handling
- *can't be punctured* — leave rocks in backfill
- *pipe expands and contracts* within Gilsulate structure
- *proved in actual use* in hundreds of new construction and replacement installations

Send coupon for descriptive literature.

AMERICAN GILSONITE COMPANY
SALT LAKE CITY, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

No skills necessary—simply pour Gilsulate out of 100 pound bags, tamp and backfill. Can be used under any and all conditions—no matter how many pipes, whatever the space.

GILSULATE®
THE TRIPLE-ZONE INSULATION
FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES.

American Gilsonite Company
134 West Broadway, Salt Lake City 1, Utah
or 1145 East Jersey Street, Elizabeth 4, N. J.

Please send me descriptive literature on Gilsulate

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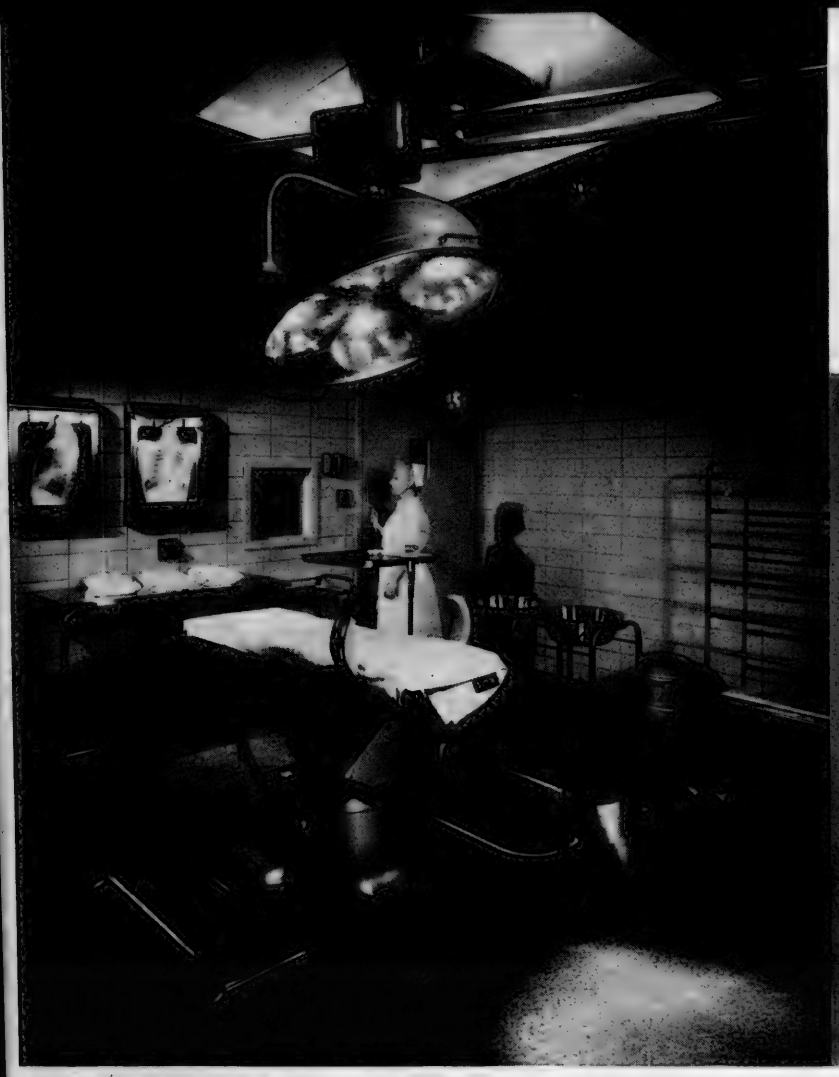
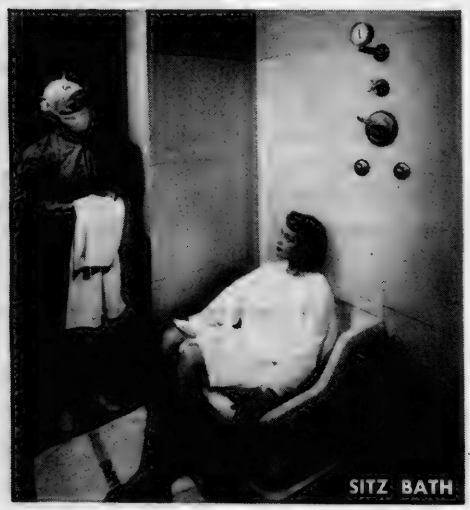


Temperature

One of Three Modern Air Conditioned Operating Rooms pneumatically controlled by Powers Thermostats and Hygrostats. Photo above shows modern Thoracic type operating table. X-Ray Room and Research Lab, (at right) and other spaces thruout this modern nine story building also are Powers controlled.



POWERS THERMOSTATIC WATER MIXERS
insure utmost Comfort and Safety in shower baths for doctors and nurses adjoining the operating rooms. Sitz baths and showers located throughout the building for patients also are equipped with Powers Thermostatic Water Mixers.

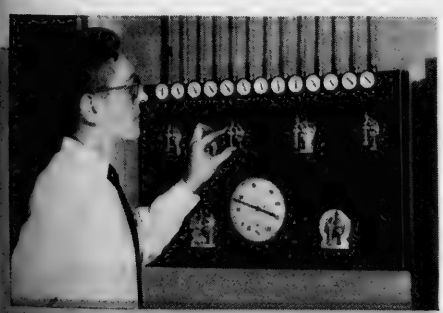
POWERS Thermostatic Water Mixer complies fully with Veterans Hospital safety requirements in Federal Specifications WW-P541a.

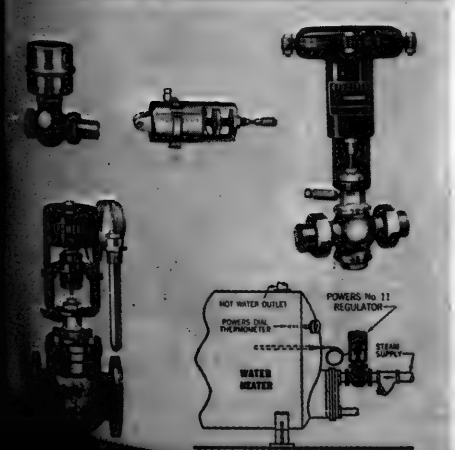
Plumbing Fixtures and Trim: AMERICAN RADIATOR & STANDARD SANITARY CORP.

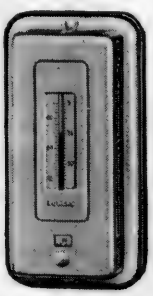
Throughout This Modern TB Sanitarium is POWERS Controlled

W CHICAGO STATE TUBERCULOSIS SANITARIUM

ERVISING ARCHITECT, STATE OF ILLINOIS, C. HERRICK HAMMOND • ASSOCIATE ARCHITECT, PHILIP B. MAHER
CONSULTING ENGINEER: ROBERT E. HATTIS
ATING CONTRACTOR: ECONOMY PLUMBING & HEATING CO. • PLUMBING CONTRACTOR: M. J. CORBOY CORP.







Here is one of the nation's most colorful modern TB Sanitariums. It is equipped with the latest medical research facilities for carrying on the fight to eradicate tuberculosis.

No other firm but Powers can supply the great diversity of temperature controls now required in modern hospitals for heating, air conditioning, blood banks, hydrotherapy, shower baths, dishwashers, laundry dryers and all types of water heaters. Only a few of our complete line of controls used in the above building are shown.

Experience gained by Powers in this and many other important buildings should be valuable when you need help in selecting temperature control. Why not call in Powers on your next job?

THE POWERS REGULATOR COMPANY

SKOKIE, ILL. • OFFICES IN OVER 50 CITIES IN U.S.A., CANADA, AND MEXICO
SEE YOUR PHONE BOOK

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

(b49)

"INDOOR WEATHER" that's right for every season and every job... select it from the complete line of

herman nelson

HEATING AND VENTILATING EQUIPMENT

From a propeller fan installation . . . to a complete heating and ventilating system—you've got everything you need in Herman Nelson products. Right now, it's time to set the stage for summertime efficiency with Herman Nelson ventilating units, fans, and unit blowers.

If it's Herman Nelson engineered, you can be sure it's superior in performance, made for long, economical operation—and styled with beauty that appeals. Out of the vast Herman Nelson line, you can plan all types of heating and ventilating systems for commercial, industrial, institutional needs. AAF branch offices and distributors all over the U. S. offer specialized engineering help and recommendations on specific jobs. Avail yourself of this help. And write for literature on America's foremost line of heating and ventilating equipment!

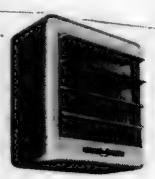
AAF herman nelson

American Air Filter COMPANY, INC.

294 Central Avenue, Louisville 8, Ky.

VERTICAL UNIT HEATER

Write for Catalog No. 700



HORIZONTAL UNIT HEATER

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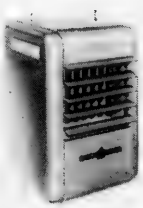

GAS FIRED UNIT HEATER

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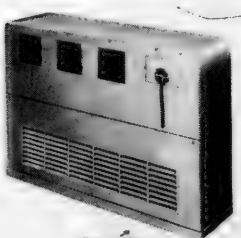

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INDUSTRIAL UNIT HEATER

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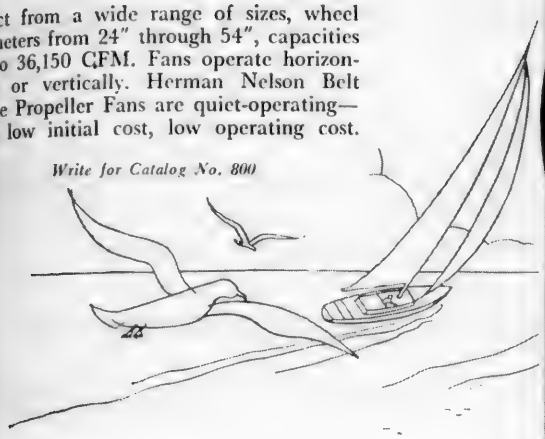
herman nelson

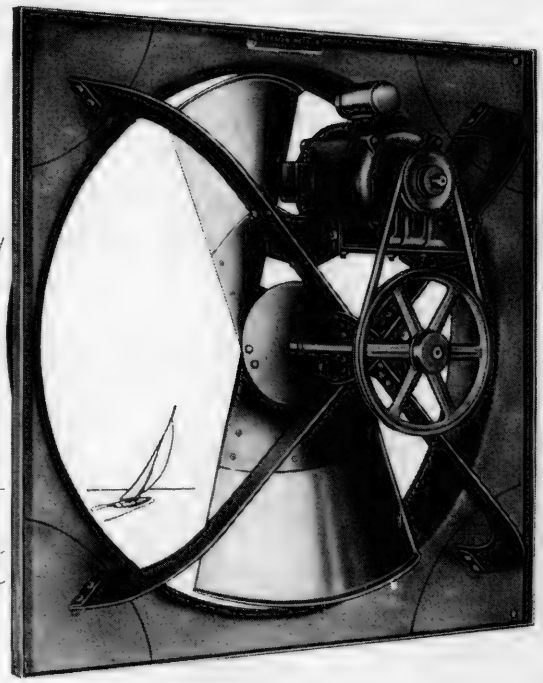
BELT DRIVE

PROPELLER FANS

Select from a wide range of sizes, wheel diameters from 24" through 54", capacities up to 36,150 CFM. Fans operate horizontally or vertically. Herman Nelson Belt Drive Propeller Fans are quiet-operating—give low initial cost, low operating cost.

Write for Catalog No. 800





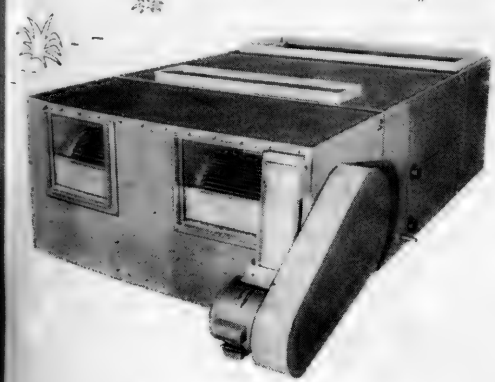
herman nelson

BELT DRIVE

UNIT BLOWERS

Herman Nelson Unit Blowers handle more air with less horsepower, less noise. Belt Drive Unit Blowers are offered in both slow speed and non-overloading types. Wheel diameters 9" to 30". All Herman Nelson Unit Blowers are available for any discharge and rotation.

Write for Catalog No. 825



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HEATING AND VENTILATING UNIT

Write for Catalog No. 775

...plus 3 NEW RADIATION PRODUCTS

HERMAN NELSON FINNED RADIATION

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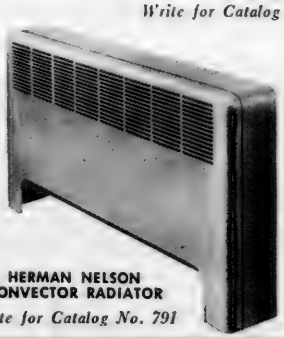


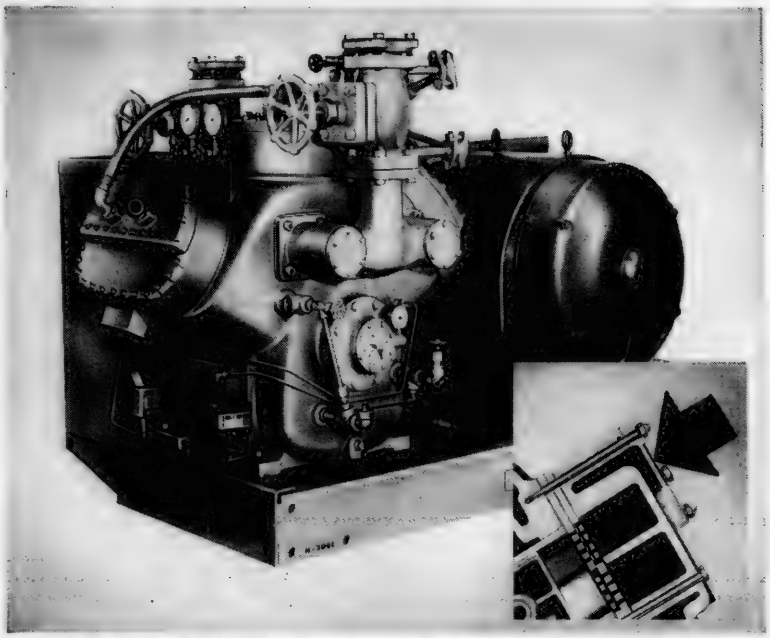
HERMAN NELSON CONVECTOR RADIATOR

Write for Catalog No. 791

HERMAN NELSON BASEBOARD RADIATION

Write for Catalog No. 792

Look at all the features of Worthington's new high-speed ammonia compressor



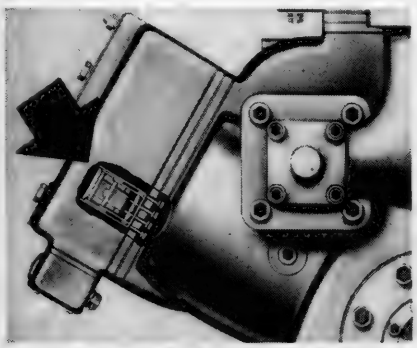
IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings. Cross section shows water jacketing on one of the cylinders.

High operating efficiency and lighter weight make this modern unit the talk of the industry

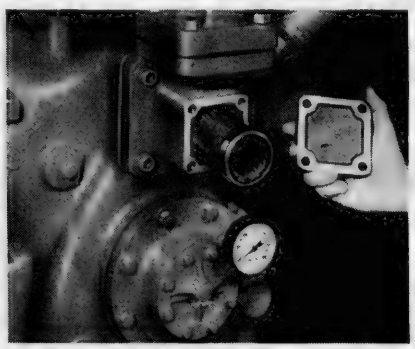
These lightweight, compact Worthington ammonia compressors have the same high operating efficiency and versatility as their lower speed counterparts.

Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines.

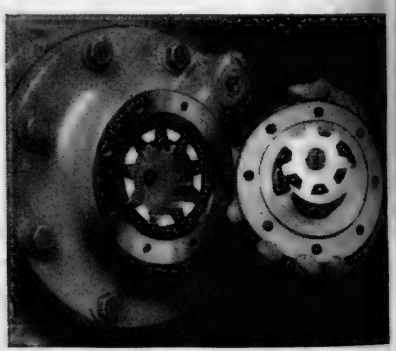
Get in touch with your nearest Worthington district office for more facts about these rugged compressors. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.56, Holyoke, Mass.



ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor with a normal torque motor; power consumption is automatically balanced against load. Separate unloader units allow easy maintenance . . . no oil or gas pressure lines to worry about.



NEW SUCTION MANIFOLD, with cover plate over suction strainer inlet, allows easy removal of the suction gas strainer for cleaning, without disturbing any of the pipes, valves or other parts. The strainer is unique in that it fits entirely within the crankcase manifold, requiring no additional space.



NEW FORCE-FEED LUBRICATION SYSTEM—full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Oil is filtered through a strainer in the crankcase for protection of pump and other moving parts.

A.3.56

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

125 models

FOR EVERY APPLICATION:

- Freon-12, Freon-22, Methyl Chloride, Ammonia
- liquid line, suction line, hot gas discharge and compressor unloading service
- brine water, steam, air and oil
- all types of electric current
- explosion-proof types
- connection sizes: ½" to 2⅝" solder, ⅜" to 2" pipe thread
- controlled by thermostats, float switches, timers and many other control devices

find your solenoid valve in a minute...

in your ALCO CATALOG

...the complete line of solenoid valves at your fingertips. No lost time thumbing through other catalogs for any standard or special model!

WRITE FOR YOUR CONDENSED CATALOG NO. 20... and technical bulletins 173 and 182 today.

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ALCO VALVE CO.

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Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

Get these 18 advantages in

Trane Self-Contained Units now up t

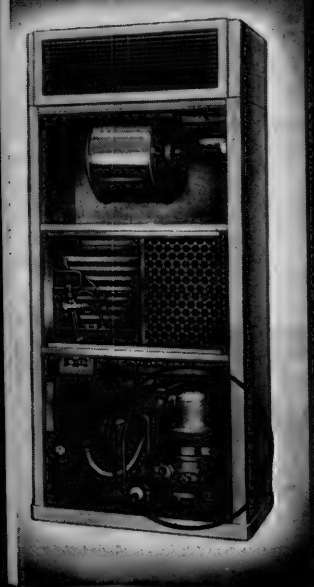
Trane Units, with the industry's most advanced compressors, give better performance . . . lower operating cost

Give customers greater comfort for lower operating cost . . . longer life for less maintenance with TRANE Self-Contained Air Conditioners. New accessible hermetic compressors in 3, 5 and 7½ ton models. Compressors in all models are newest, most advanced design in the industry. All internal wiring and refrigerant piping is done at the factory . . . saves time, saves installation cost. Built-in evaporative condenser is optional on the 10, 15 and 20 ton sizes.

For complete information, call your nearest TRANE Sales office, or write TRANE, La Crosse, Wisconsin.

Check These Features of Trane 10, 15 and 20 Ton Units

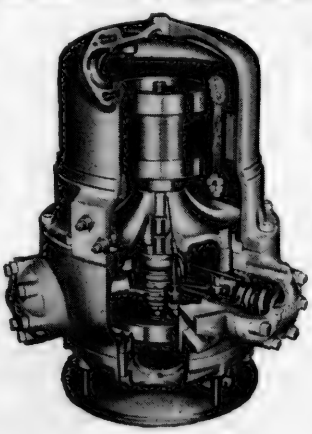
1. **High speed, smooth running compressor** has 85% volumetric efficiency at normal operating conditions.
2. **Multi-step unloaders save power** automatically as load is reduced. Boosts compressor life, cuts cycling.
3. **Exclusive! Valves last 800% longer** than ordinary steel valves. Ring type valves are cadmium plated. Only TRANE compressors have this feature.
4. **Direct drive cuts power costs 5%!** Eliminates power-wasting belt drives, reduces maintenance.
5. **Simplified maintenance!** Minimum number of bolts and gaskets. Major parts are complete sub-assemblies. Cylinder liners are easily removable. All major moving parts are interchangeable between 10, 15 and 20 ton sizes.
6. **Forced lubrication!** Reversible oil pump has three times needed capacity. Oil is twice filtered—passes over three magnetic plugs.
7. **Extra safety!** Spring-loaded safety heads prevent liquid slug damage. Oil pressure failure protection switch provided.
8. **Quiet operation!** All rotating parts dynamically and statically balanced. Compressor-motor unit mounted on vibration isolators. Vibration eliminated from frame.
9. **Liquid-to-suction heat exchanger** is standard equipment. Boosts efficiency of compressor and evaporator, protects against liquid slugging.
10. **Complete control panel standard equipment.** All controls fully wired, cuts installation cost. Refrigeration, starting and operating controls for entire unit are provided.
11. **Serviceman's dream!** All major parts easily accessible from front of unit. Cam-lock panel quickly removable. Clean-cut factory assembly simplifies maintenance.
12. **More rugged construction!** Heavy-duty frame is made of full ¼" angle iron for added strength and rigidity.
13. **Motor noise insulated from air stre** Insulated panel separates motor sect from air handling section. All oth panels are insulated with ½" of gl wool.
14. **TRANE Fans have high efficiency,** low h requirement.
15. **Water pump located outside moist stream** for maximum protection—long life.
16. **Power costs cut!** Large orifices on sp nozzles provide greater flow, cut pu power cost, reduce scaling and ma tenance.
17. **Complete set of liquid line contr** provided as standard equipment.
18. **Saves up to 95% water consumpti** more on days of high humidity. Co densate from evaporator coil in con tioner section is piped to conden water tank . . . cuts make-up water co



New Accessible Hermetic Compressor in 3, 5, 7½ Ton Units

Easier to service . . . more efficient performance

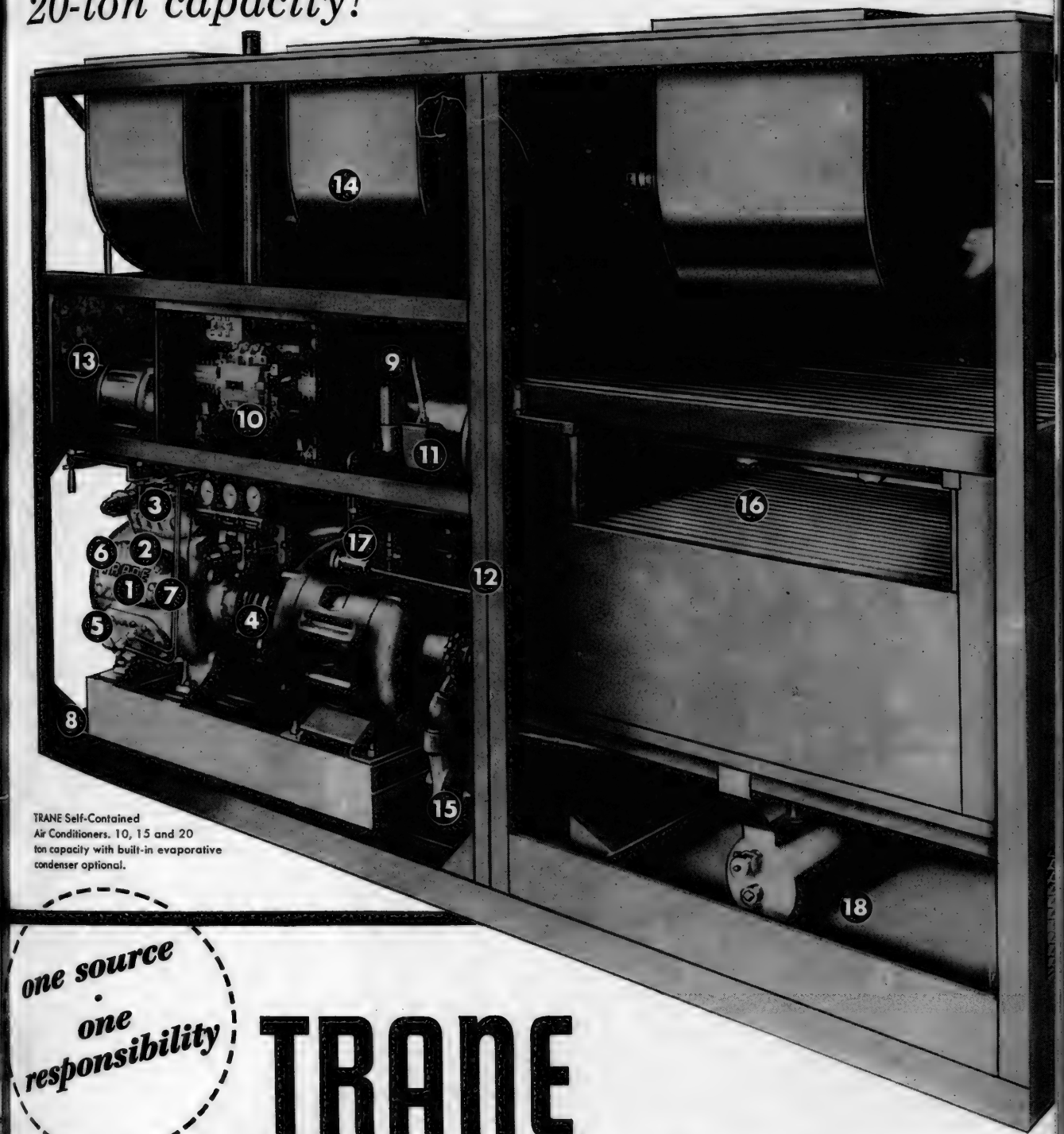
- **Less vibration.** Vibration displacement in mils: Horizontal, 0.5; vertical 0.2 and radial, 1.0!
- **Accessible hermetic design**—bolted construction permits servicing. Motor and compressor completely sealed—no shaft seal to leak costly Freon. Suction strainers and valves easy to get at. Lube oil can be drained through exterior plug.
- **Exclusive reversible oil pump has no wearing parts!** Lasts a lifetime, gives positive pressure instantly on start-up.
- **Exclusive lifetime valves!** Cadmium plated valves last up to 800% longer than ordinary valves!



- **Major servicing is easier!** Minim number of internal bolts and gas speed servicing. Replaceable cyli liner saves reboring. Liner and va easily reached through remov spring-loaded safety head.
- **Motor can't be damaged by w failure!** It's cooled by the suc gas instead. Cylinder liners gas cooled.
- **Self-contained cabinet has mod design** for installation in conditi space. Gray crackle finish, roun corners, heavy furniture steel ing, fully sound insulated.

compact air conditioner . . .

20-ton capacity!



TRANE Self-Contained Air Conditioners. 10, 15 and 20 ton capacity with built-in evaporative condenser optional.

one source • one responsibility

TRANE

Self-Contained Air Conditioners bring you the most advanced compressors in the industry!

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

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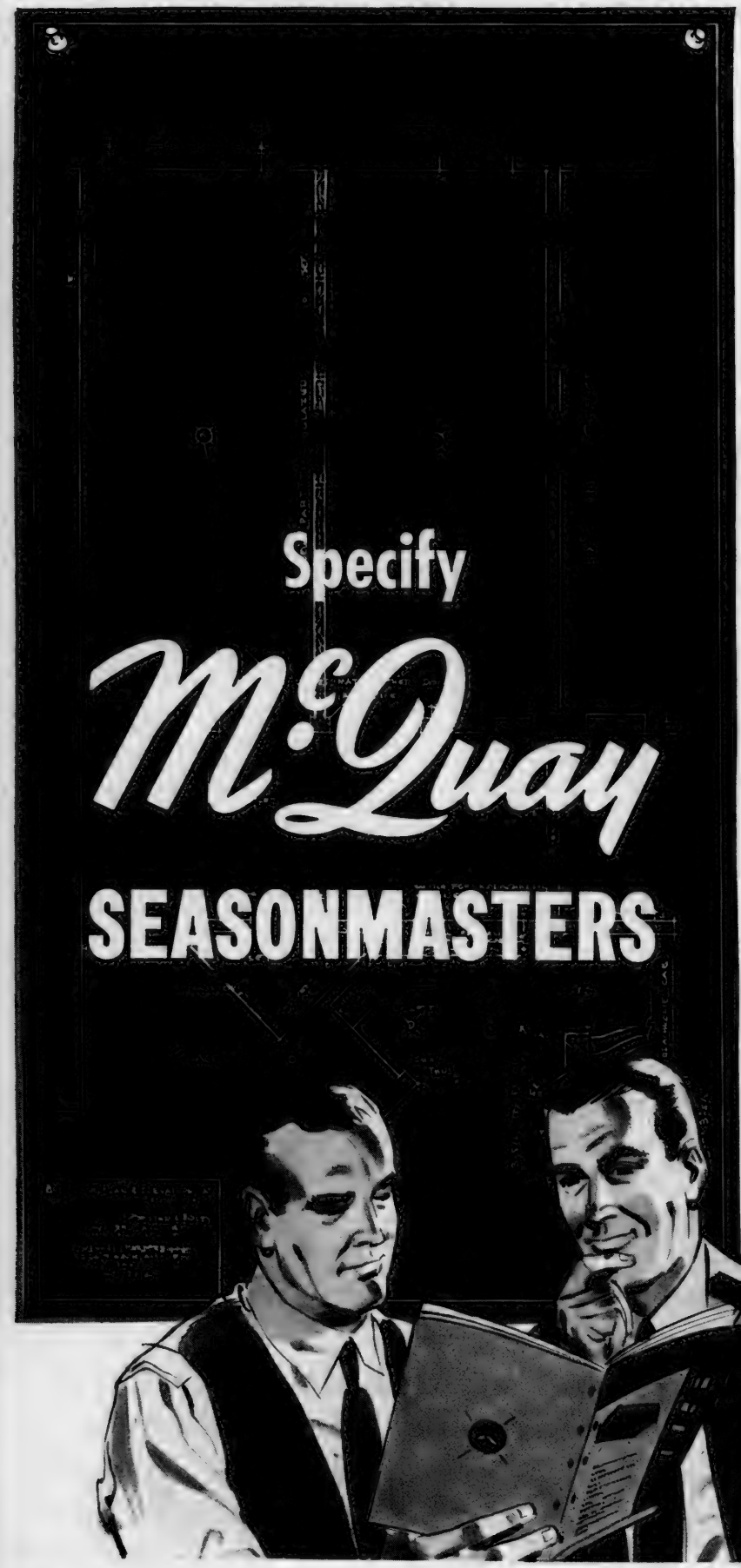
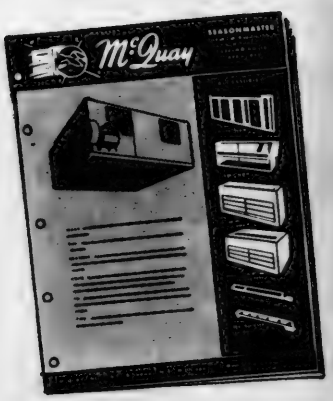
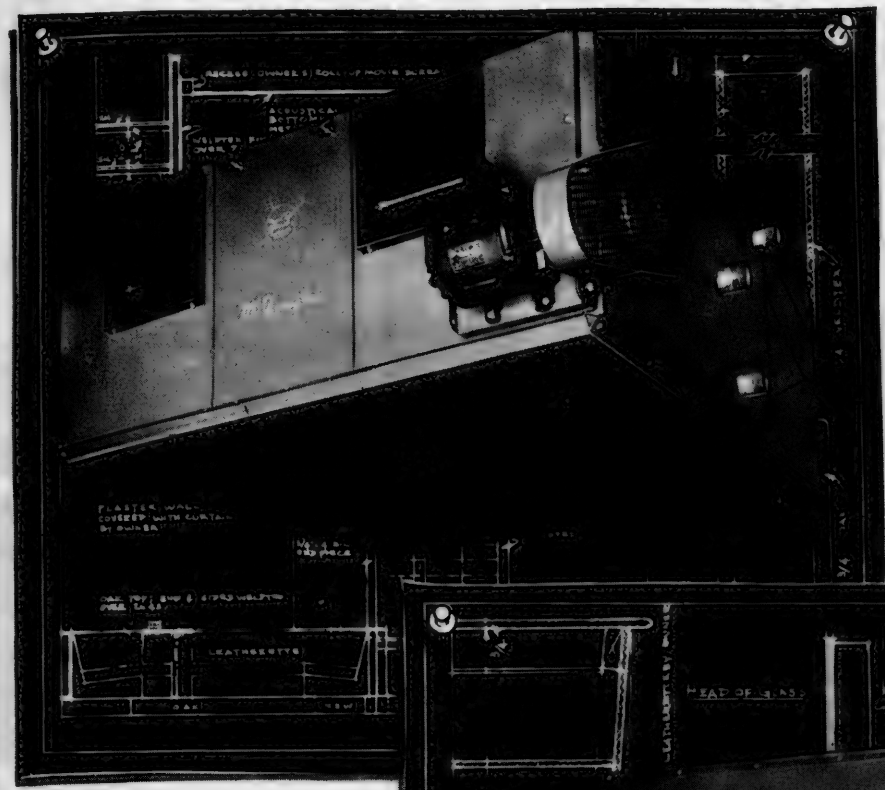




McQuay's 24-page catalog No. 505 will give you a big assist in planning the installation of central station air conditioners that will meet requirements of the job in every particular.

Seasonmasters come in 14 models, in both horizontal and vertical types and in a wide range of Cfm and Btu capacities. All models have maximum flexibility in location of coil connections and air openings. A full line of cooling and heating coils and a wide variety of accessories are available.

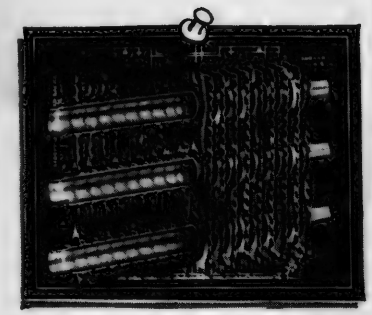
The many practical combinations are another McQuay engineering achievement that make it possible for you to install custom-made systems, and the McQuay Seasonmaster catalog No. 505 gives you complete information on how to do it. Get your copy now and be ready to make the right recommendations . . . recommend McQuay Seasonmasters with complete confidence of quality and dependability. Representatives in principal cities. Or write McQuay Inc., 1619 Broadway St. N. E., Minneapolis 13, Minn.



McQuay SEASONMASTERS

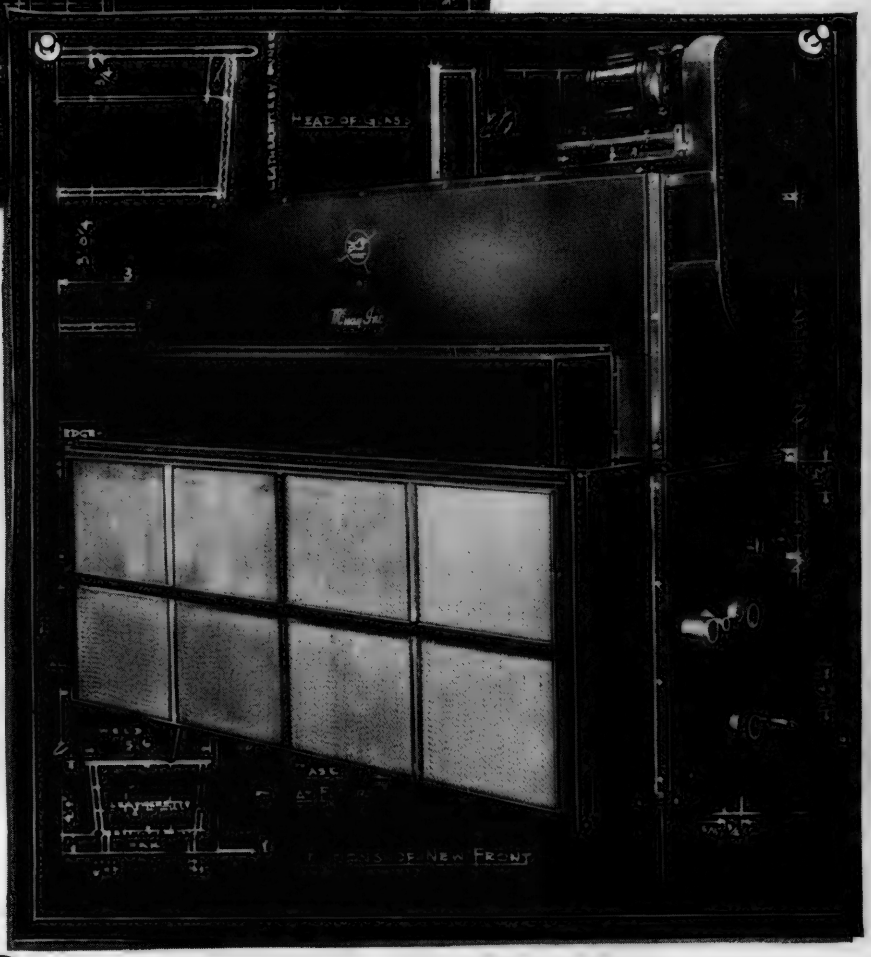
14 MODELS IN THE LINE

Seasonmasters are adaptable to all year 'round demands...cooling and dehumidification, heating and humidification, positive ventilation, and air filtering. All models are available in both horizontal and vertical types.



FAMOUS RIPPLE-FIN CONSTRUCTION

McQuay Ripple-Fin Coil construction is your assurance of unmatched heat transfer efficiency and economical long-life performance. Seamless copper tubes are expanded into wide, smooth collars of aluminum fins. Headers are heavy wall, seamless copper tubes.

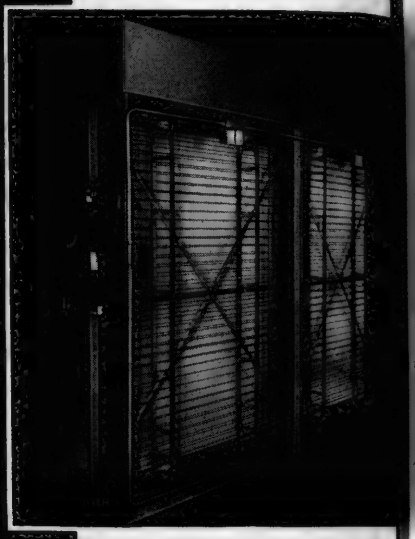


McQuay INC.

HEATING
AIR CONDITIONING
REFRIGERATION

INTRODUCING THE *NEW*

A ROLL-O-MATIC filter of two 5'0" wide by 8'0" high sections —capacity 26,700 cfm.



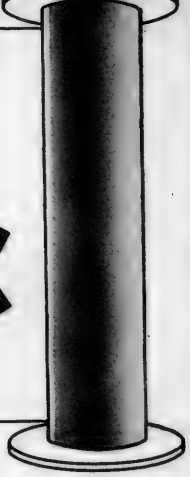
Rear view of ROLL-O-MATIC showing simplicity of design which leads to lightweight and easy installation.

Just like putting film in a camera! End of AMER-*glas* is attached to motor-driven spool at bottom of filter, which re-rolls soiled media for later disposal.

Single motor provides power for both introducing clean media and rewinding the soiled portion it replaces—will operate a maximum of 3 to 6 sections depending on height.

Roll-O-MATIC

ANOTHER AAF ENGINEERING FIRST



A "Dry" Type Viscous Air Filter That Maintains Its Efficiency Automatically Up To One Year With One Roll of Low-Cost AMER-glas Media

Imagine a high efficiency "dry" type automatic air filter capable of maintaining its established operating resistance for months on end without an hour lost or dollar spent on maintenance! The new AAF ROLL-O-MATIC can and will—and does it in the simplest, most saving way ever devised.

FEATURES AMER-GLAS FILTER MEDIA

The ROLL-O-MATIC is a viscous filter with "dry" type characteristics—combines the efficiency and simplified maintenance of a dry filter with the high dust holding capacity and velocity characteristics of a viscous filter. Its filtering media, called AMER-*glas* is a 2" thick resilient mat made up of continuous glass fibres held together by a high temperature plastic bond, and sprayed with a special non-flammable Viscosine fluid-jell. The ROLL-O-MATIC mat is made in continuous lengths up to 70 feet.

ROLL-O-MATIC PRINCIPLE MAINTAINS UNIFORM RESISTANCE AUTOMATICALLY

The AMER-*glas* media, rolled on a spool, is installed in the ROLL-O-MATIC just like the film in a camera. With the roll mounted at the top of filter, the media, moving as a continuous curtain down the face of the filter, is re-rolled automatically at the bottom on an empty spool which is rotated by a motor operating through a simple reduction gear and chain drive.

Media usage is in direct proportion to the dust content of the air, in that movement of curtain is regulated by a pressure switch which measures its resistance to air flow. As the filtering curtain accumulates dust, the resistance to air flow rises—and when it reaches a predetermined point, the pressure switch actuates the drive motor. Clean media is introduced automatically in sufficient quantity to lower resistance to its original operating level—and the dust-laden media is re-rolled for later disposal. In brief—the ROLL-O-MATIC operates at top efficiency day in and day out without your even raising a hand to press a button.

While media usage will, of course, vary with dust loads, field tests indicate that, under normal operating conditions, one roll of AMER-*glas* will be sufficient for one year's operation, per 10,000 cfm of capacity. But regardless of media life—you can enjoy the efficiency and automatic operation of ROLL-O-MATIC for less than the cost of throw-away filters.

OTHER ROLL-O-MATIC ADVANTAGES

The very nature of ROLL-O-MATIC design makes for important weight saving; easy low-cost installation; and eliminates need for oil and water for washing. AMER-*glas* media is underwriters' approved (Class 2). Maintenance, other than installing clean media, is both simple and infrequent.

Here is another AAF Engineering "First"—and by all known standards of air filter performance by far the greatest. For complete design and engineering data on the new ROLL-O-MATIC, call your local AAF representative or write direct for Bulletin No. 248.

AAF

American Air Filter

COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 294 Central Avenue, Louisville 8, Kentucky

More Space and Comfort

—today's favorite "customer appeal"

INVISIBLE Panel Heating makes every inch of space usable . . . with comfort too!

It was a woman who first called it *"invisible"* heating . . . for *flexible* living.

With a woman's intuition she saw right to the heart of the matter. Here was the comfort of pleasant, natural, healthful heat *plus* absolutely no *visible* source of heat supply in the living area. No more spending a lifetime with the furniture always in one place! For radiant panel heating imparts that *flexibility* needed for modern living, the assurance of a fresh, redecorated look whenever desired. Simply by shifting the furnishings to new positions . . . because every inch of floor and wall space is unobstructed and *usable.*

No wonder radiant panel heat is increasingly popular. It satisfies a man's mechanical and technical requirements; it delights the homemaker's need for comfort with decorative flexibility.

But though modes and methods of heating may change, the best medium of transmission for wet heat goes on forever . . . time tested *steel pipe.* For steel pipe has been *proved* in more than 60 years of conventional hot water and steam heating applications. It also has the qualities of economy, durability, weldability and formability required for a successful *invisible* heating system. In fact it is the most widely used pipe in the world for plumbing, heating, fire sprinkler systems, air, gas and water lines!

Write for the free 48 page color booklet, "Radiant Panel Heating with Steel Pipe."

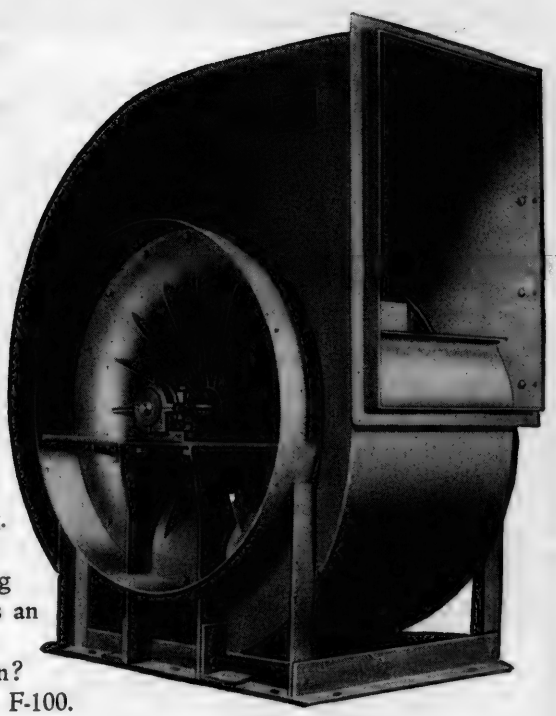
Steel Pipe is First Choice

COMMITTEE ON STEEL PIPE RESEARCH

AMERICAN IRON AND STEEL INSTITUTE

350 Fifth Avenue, New York 1, N.Y.

You'd Never Believe It Could Be So Quiet...



THAT'S WHY THEY CALL IT THE "HUSH-A-BYE BUFFALO" FAN

Briefly, the secret of the "Hush-A-Bye" quiet of the new "Buffalo" Type "BL" Limit-Load Ventilating Fan is *smooth* air handling. From inlet to outlet, air is moved through the fan almost "without a ripple". This new standard of air handling promises important benefits in any building where quiet is an efficiency factor. Why not see the engineering facts—the "Q" Factor*—behind this great new fan? Simply write for Bulletin F-100.

**The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, N. Y.

Publishers of "Fan Engineering" Handbook

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Now...A Westinghouse Multi-Zone Unit Automatically Conditions Air— Up to 12 Independent Zone Areas

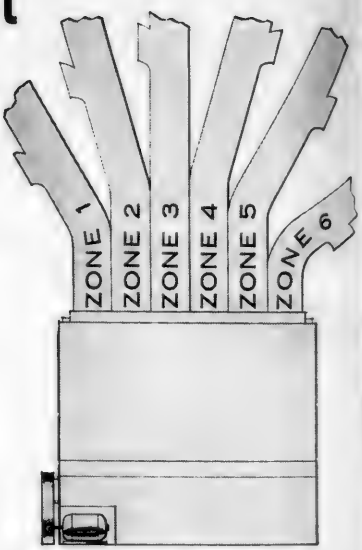
This rugged, compact central plant air conditioning unit supplies air, conditioned for simultaneous unequal heat load demands, in various zones requiring individual temperature and humidity control.

Formerly, heat load variations caused by differences in building construction, changes in occupancy, wind or solar exposure, could be controlled only by separate supply systems for each zone or by expensive zone reheat arrangements.

Now . . . this problem can be solved with a single Westinghouse Multi-Zone Air Conditioning Unit. Efficient . . . economical . . . this versatile unit supplies air—conditioned at a central location—for the individual needs of as many as 12 zones.

This complete unit—fans, coils, motors and starters—is designed and manufactured by Westinghouse, permitting a single equipment warranty with undivided responsibility . . . an exclusive feature in all Westinghouse Air Handling Units.

For complete information about this outstanding advance in central plant air conditioning, call your nearest Sturtevant Sales Engineer today. Or write: Westinghouse Electric Corporation, Sturtevant Division, Boston 36, Mass.



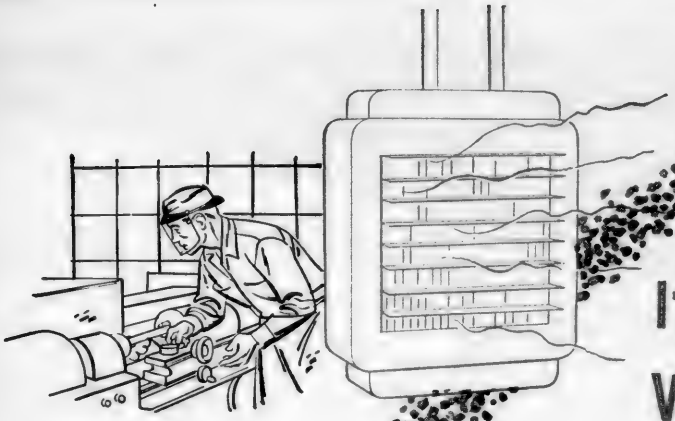
TOP VIEW
(FOR SIX ZONES)

Multi-Zone Units are of the blow-through type with divided outlets to serve multiple zones by supplying heated or cooled air, or controlled mixtures of both, to each zone.

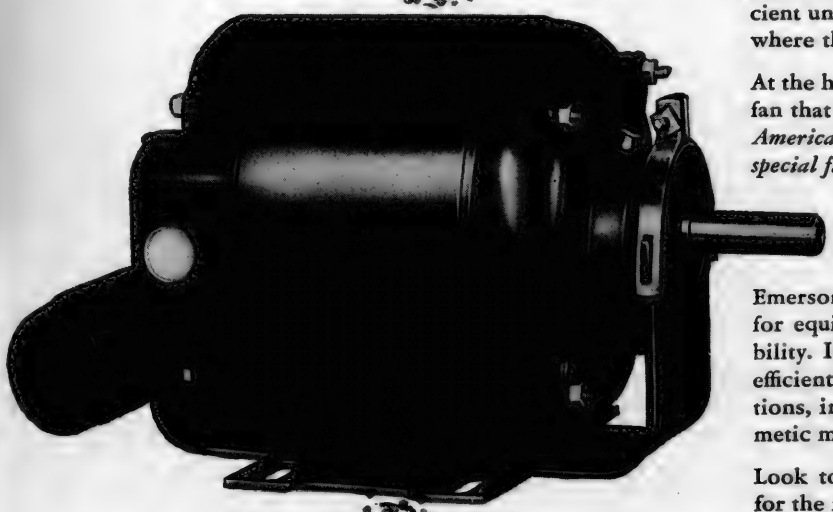
WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80393



It tells heat where to go!



It would be a cold day in many an industrial plant without modern unit heaters. These efficient units pour out warmth and comfort right where they are needed.

At the heart of each unit is a quiet, dependable fan that sends the heat on its way. *On many of America's best known unit heaters Emerson-Electric special fan-duty motors power the fans.*

Emerson-Electric specializes in building motors for equipment with a reputation for dependability. It has done so for 63 years, and offers efficient motors for a wide variety of applications, in ratings from 1/20 to 5 h.p., and hermetic motors ⅛ to 20 h.p.

Look to Emerson-Electric if you are looking for the right motor to power your product efficiently, dependably. Your inquiry is invited.

THE EMERSON ELECTRIC MFG. CO.
St. Louis 21, Mo.

Write for these Emerson-Electric Motor Data Bulletins

Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ M-496-A Capacitor-Start
- ☐ M-496-B Split-Phase
- ☐ M-496-C Integral
- ☐ M-496-D Fan-Duty
- ☐ M-496-E Oil-Burner
- ☐ M-496-F Jet Pump
- ☐ M-496-G Blower

EMERSON ELECTRIC
MOTORS • FANS — APPLIANCES

is something
ALWAYS
missing?
(to cut your profit)

...then switch to the one line that meets every selling need

* **EXAMPLE No. 3:** Your own experience will tell you that it's usually easier to sell an established name. This is a premium advantage you enjoy when you offer Bryant. First, because Bryant—in 45 years in business—has earned a reputation for quality in millions of American homes. Second, because Bryant—over this same span of years—has consistently advertised nationally and locally to support *your* selling efforts—*longer than any other manufacturer of automatic heating, air conditioning and water heating equipment!*

Your nearby Bryant Distributor has complete details. It will pay you to call him today.

bryant®
HEATING | AIR CONDITIONING | WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
* 3. Established name—Good customer acceptance
4. Broad, attractive profit margins
5. Local Distributor warehousing and service
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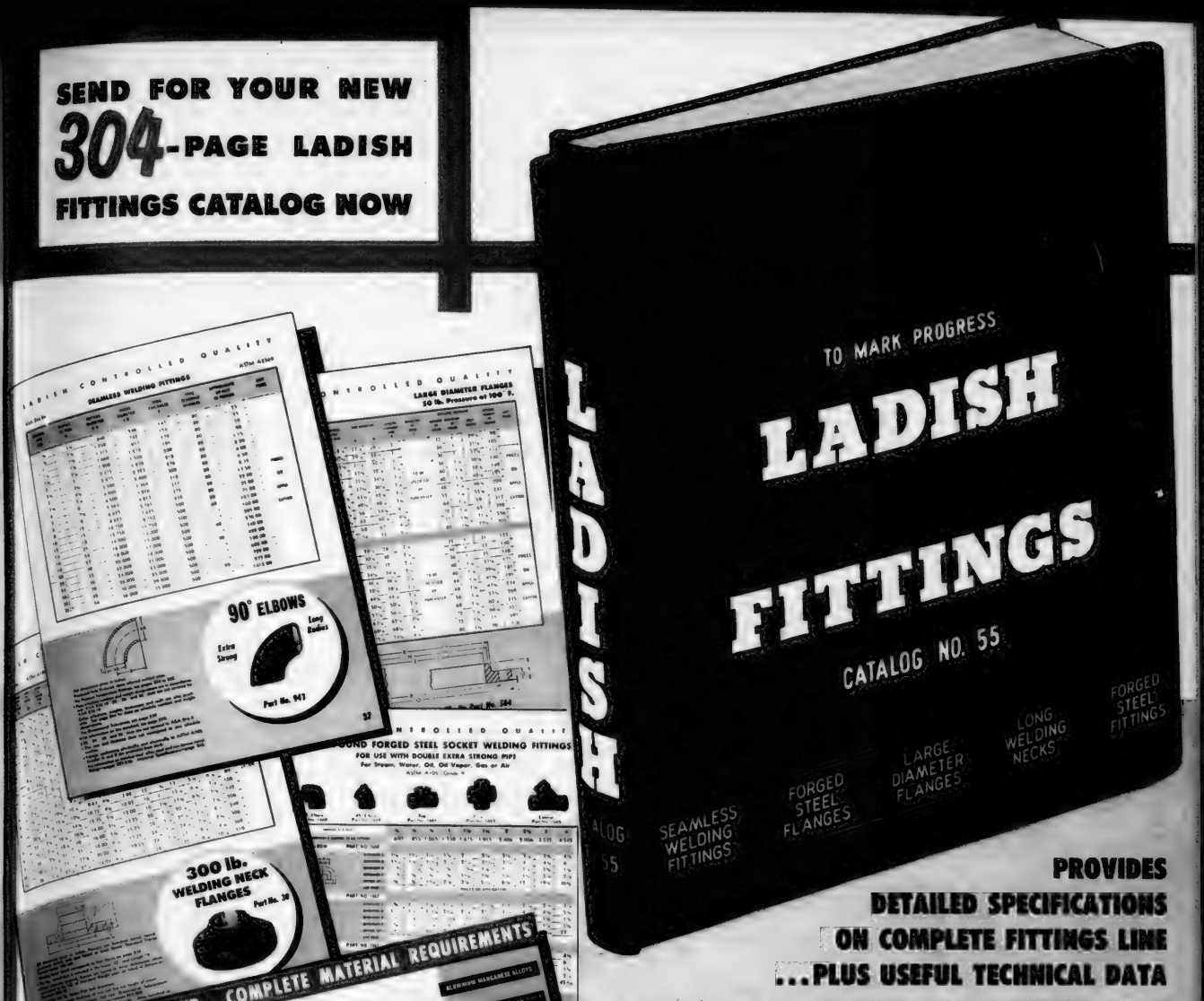
Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio

SEND FOR YOUR NEW 304-PAGE LADISH FITTINGS CATALOG NOW



PROVIDES DETAILED SPECIFICATIONS ON COMPLETE FITTINGS LINE ...PLUS USEFUL TECHNICAL DATA

Here are detailed dimensions, weights and specifications to assist in selecting proper fittings for any application... plus useful engineering and technical data. Major sections include:

68 PAGES BUTT WELDING FITTINGS
Available in Standard through Double Extra Strong weights... in sizes ½ through 42 inches.

56 PAGES FORGED STEEL A.S.A. FLANGES
Available in 150 through 2500-pound pressure ratings ... in sizes ½ through 24 inches.

20 PAGES LARGE O.D. AND T.E.M.A. FLANGES
Available in a complete range of types and pressure ratings... in sizes up to 160 inches in diameter.

7 PAGES LONG WELDING NECK FLANGES
Available in 150 through 2500-pound pressure ratings ... in sizes from 1 through 24 inches.

5 PAGES FORGED WELDLESS ROLLED RINGS
Available in diameters up to 240 inches in a wide variety of forged contours... in weights up to 40,000 pounds.

20 PAGES FORGED STEEL FITTINGS
Screwed and Socket-Welding types in 2000 through 6000-pound pressures, sizes ⅛ through 4 inches.

12 PAGES STAINLESS AND ALLOY FITTINGS
Featuring data on properties of materials and a comprehensive table of piping specifications.

56 PAGES TECHNICAL DATA TO SIMPLIFY PIPING DESIGN PROBLEMS

MAIL THIS COUPON TODAY FOR YOUR LADISH CATALOG

LADISH CO.
Dept. HV, Cudahy, Wisconsin

Please send me, without cost or obligation, the new 304-page Ladish Fittings Catalog No. 55.

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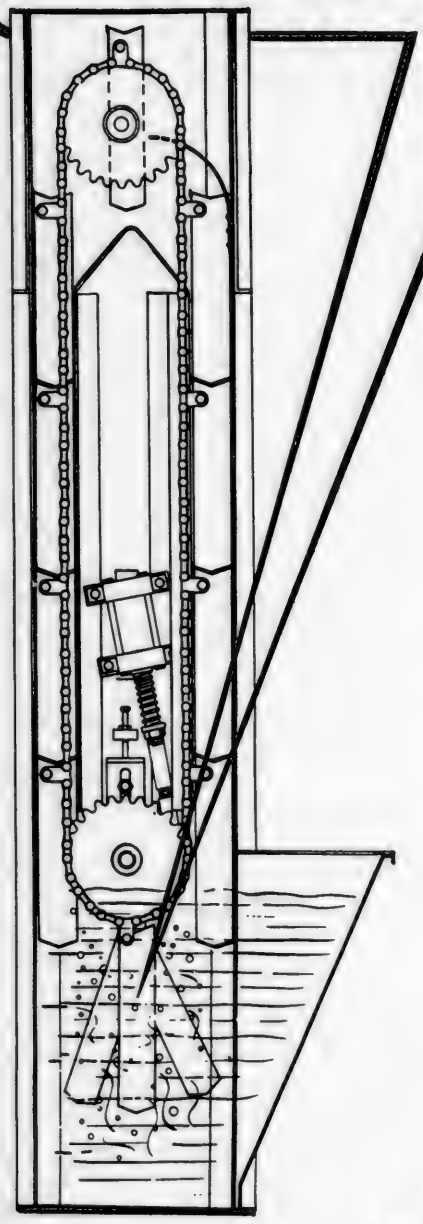
Here's why Automaze new self-cleaning air filter STAYS CLEAN AS NEW!



EXCLUSIVE "pulse-type" action is the secret of the new Automaze automatic air filter. While each panel in the revolving curtain is submerged in the cleaning tank at the bottom, it is agitated vigorously 6 or more times by a compressed air drive. This cleans each panel thoroughly as well as completely renewing the adhesive. Result: Automaze filter panels stay clean as new!

The new Automaze goes 3 to 6 months without attention—a big improvement over stationary filters that may need cleaning once a month. Even after 6 months, all you need do is remove the sludge. A special reservoir cover makes this a quick, simple operation.

Filter panels are two inches thick. They are linked in an air tight revolving curtain with panels moving up and over, like the cars on a ferris wheel. The panels always keep the same face to the air stream. The dirty face of the filter is never on the downstream side. As a result, there's no possibility of dirt being blown off the filter into the cleaned air.

Automaze gives you other advantages too. For instance, **1.** Automaze has no electrical connections located in the air stream. **2.** If desired, Automaze can be operated by remote control. **3.** A variety of media designs are available to meet different filtering conditions. **4.** When sections are bolted together, there's no need for rigid mechanical drive connections to cause alignment difficulties—each filter section contains its own drive mechanism.

The full story of the new Automaze is available to you in a catalog. Write for your copy today. Air-Maze, the filter engineers, are specialists in all types of air and liquid filtration. We draw from over 29 years experience and thousands of different filter applications. For help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.

AIR FILTERS
SILENCERS
SPARK ARRESTERS

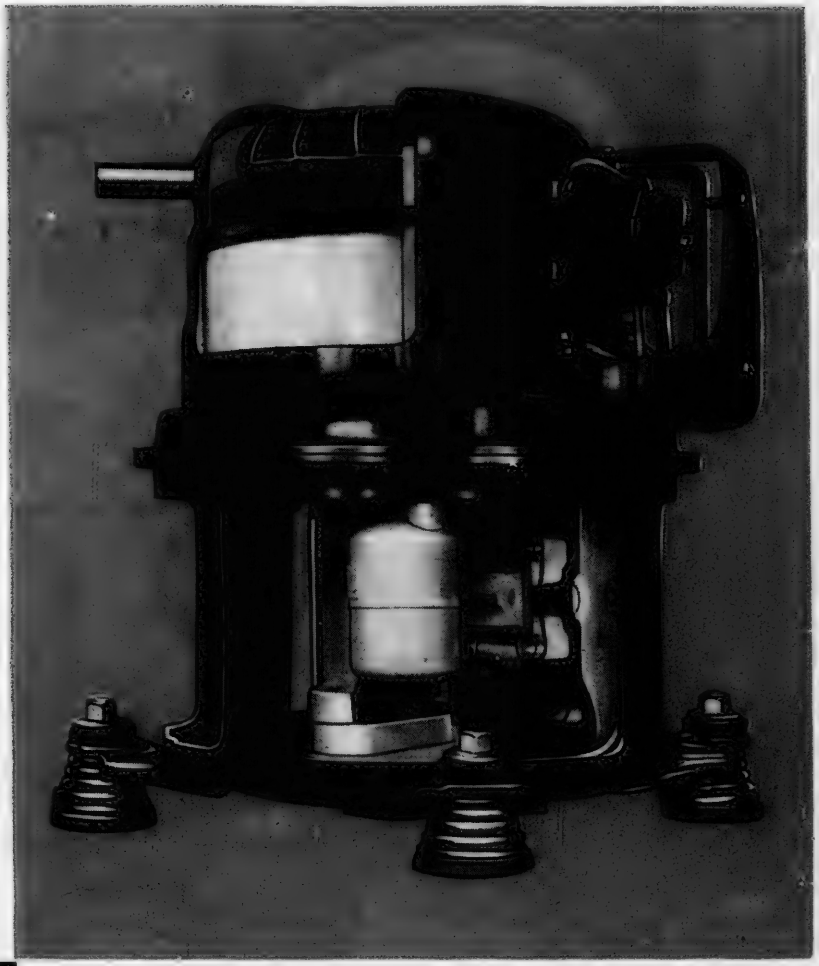
AIR-MAZE

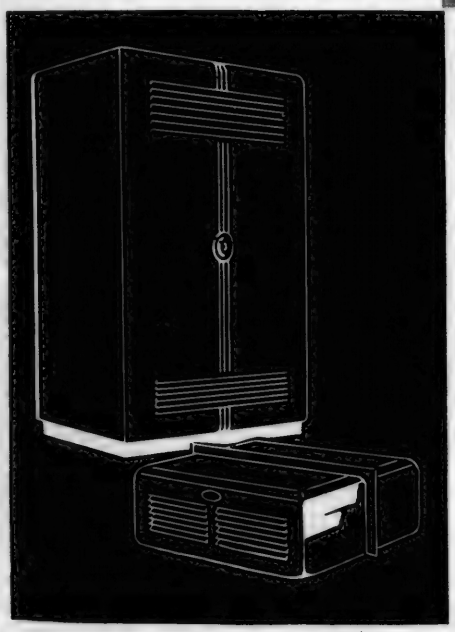
The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

COPELAND WELDED HERMETICS

bring cool-running, 2-cylinder smoothness to package air conditioning



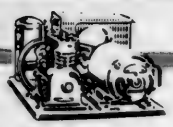


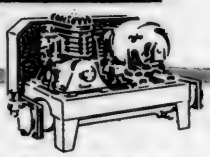
You're looking at a cutaway view of the welded motor-compressor that can give your refrigeration and air conditioning products the competitive edge you need.

This potent Copeland package is engineering at its best. Twin-cylinders bring whisper-quiet smoothness. Heavy-duty, high power factor motor insures positive performance and long-range economy. Use of F-12 in these motor-compressors can result in as much as 75 F. lower temperatures in windings, crankcase, oil and discharge side. You'll appreciate their high capacities.

We could go on, point by point, and prove construction superiority. Better yet, we want you to test the Copeland welded motor-compressor in your own equipment under your own conditions.

Write, wire or phone for details about the "try it yourself" test.





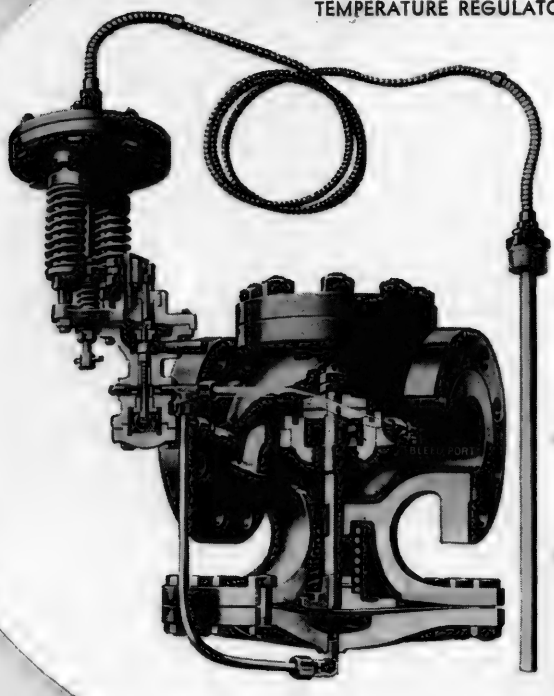
Copeland
DEPENDABLE *Electric* REFRIGERATION

REFRIGERATION UNITS (OPEN-TYPE AND COPELAMETIC) WATER COOLERS

COPELAND REFRIGERATION CORPORATION SIDNEY, OHIO

3 Reasons for Accurate Regulation

SPENCE TYPE ET150
TEMPERATURE REGULATOR



PACKLESS CONSTRUCTION

LARGE BALANCED METAL DIAPHRAGM

SENSITIVE PILOT

Spence

Packless construction eliminates the need for closely fitted parts that may stick or bind due to dirt or uneven expansion of the parts.

In Spence Temperature Regulators, the Main Valve is actuated by a large balanced metal diaphragm which responds to the slightest changes in temperature.

Sensitive Pilots are designed to limit heater pressure to an adjustable maximum. As the temperature at the thermostat drops a few degrees there is a corresponding increase in steam pressure up to the limit for which the Pilot is set.

With regulators that respond only to temperature, an increase in load is accompanied by a momentary decrease in steam pressure caused by faster condensation in the heating element. There is a time lag until the thermostat senses the temperature drop and opens the valve wider. Spence Temperature Regulators act like pilot operated pressure regulators when this occurs. They respond instantly to maintain the steam pressure until the thermostat has a chance to further increase it as needed for the heavier load.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year, without requiring extensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.

SE120

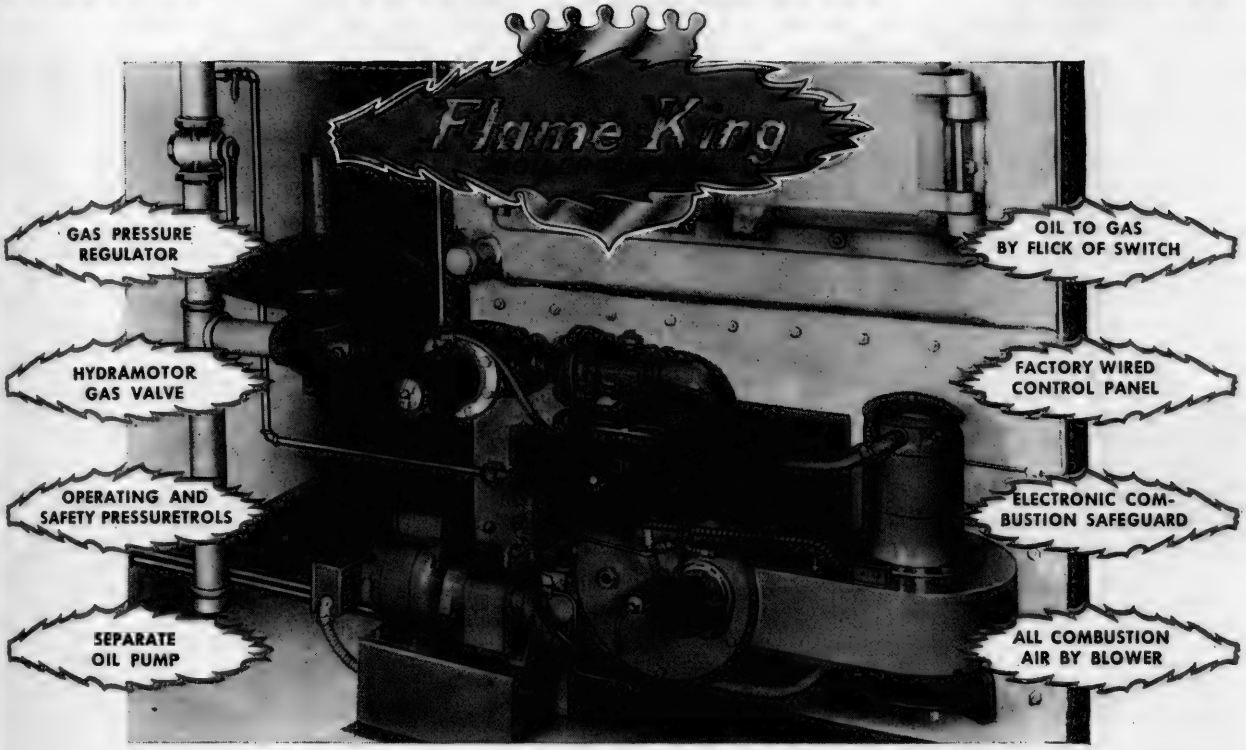
SPENCE ENGINEERING COMPANY, INC., Walden, New York

Ultimate Performance

30 to 1000 horsepower

NORTH AMERICAN

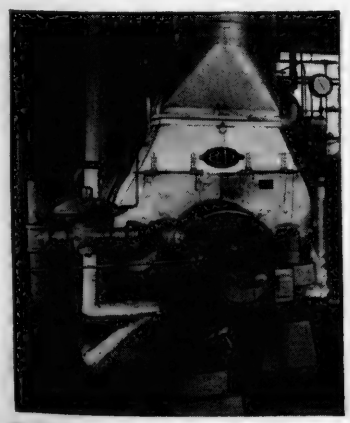
GAS, OIL or DUAL-FUEL



116 Dual-Fuel Burner illustrated available in models ranging from 30 to 83 HP

FLAME KINGS are available as gas or oil burners (that may be field converted to dual-fuel) or dual-fuel burners that will burn either fuel at the flip of a switch. Design, backed by 30 years of combustion experiences and proven by years of installations in all types of boilers, assures maximum efficiency on either fuel.

Factory packaging of FM approved electronic combustion safeguard systems provides for easy installations! Plug-in electrical components allow minimum maintenance! Burner efficiency is not dependent upon stack draft since a blower supplies 100% of the air for combustion! Blast-type gas pilot provides for positive and safe ignition!



FLAME KING on Scotch Marine Boiler

Natural gas (only 3" wc pressure necessary), mixed low pressure gases, or No. 1, 2, or 3 fuel oil burned at peak combustion efficiencies! Separate oil pump is operated only when burner is burning oil!

If you are interested in modern, efficient burners at reasonable prices, call your nearest FLAME KING distributor, or send in the coupon below.

• • •

Some areas still available for distributing representatives.

CUT OUT AND PASTE ON YOUR LETTERHEAD

We want more information

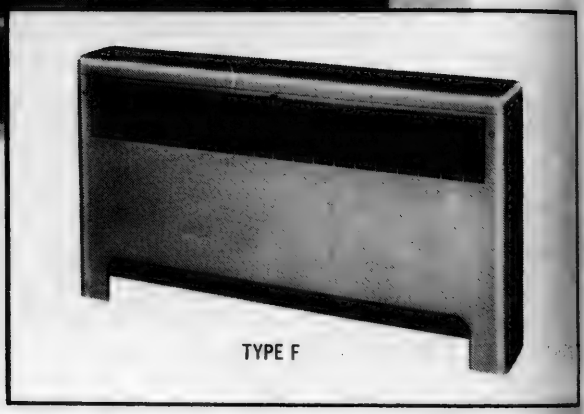
NAME_____

TITLE_____

Mail today to
The NORTH AMERICAN Mfg. Co.
Cleveland 5, Ohio

1350 Lakeshore Drive Apartments, Chicago

Loebl, Schlossman & Bennett—Architects
Samuel R. Lewis & Associates—Consulting Engineers
M. J. Holleran—Plumbing & Heating Contractor
S. N. Nielsen Company—General Contractor
Draper & Kramer, Inc.—Managing Agents



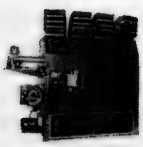
TYPE F

740 ULTRA-MODERN LIVING UNITS COMFORTABLY HEATED

By *Airtherm* CONVECTORS

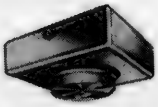
The clean, modern beauty of Airtherm Convectors fits perfectly into these functional interiors. Outstanding performance and easy maintenance make Airtherm Convectors exceptionally practical for this huge apartment project. To help you solve a wide range of heating problems Airtherm Convectors are available for wall, recessed or free-standing installation.

For Heating Satisfaction . . .
Think First of
Airtherm



Oil or Gas Direct Fired Heaters

Horizontal Type Unit Heaters



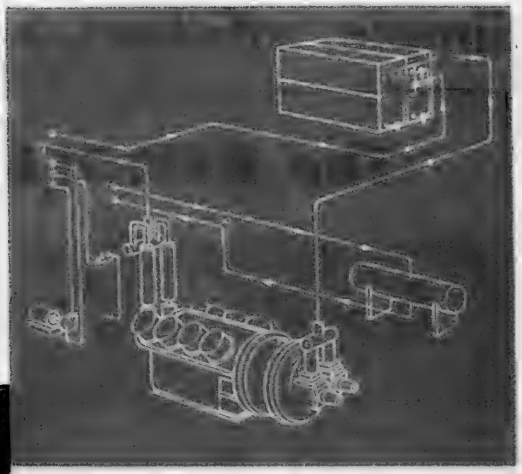
Vertical Type Unit Heaters

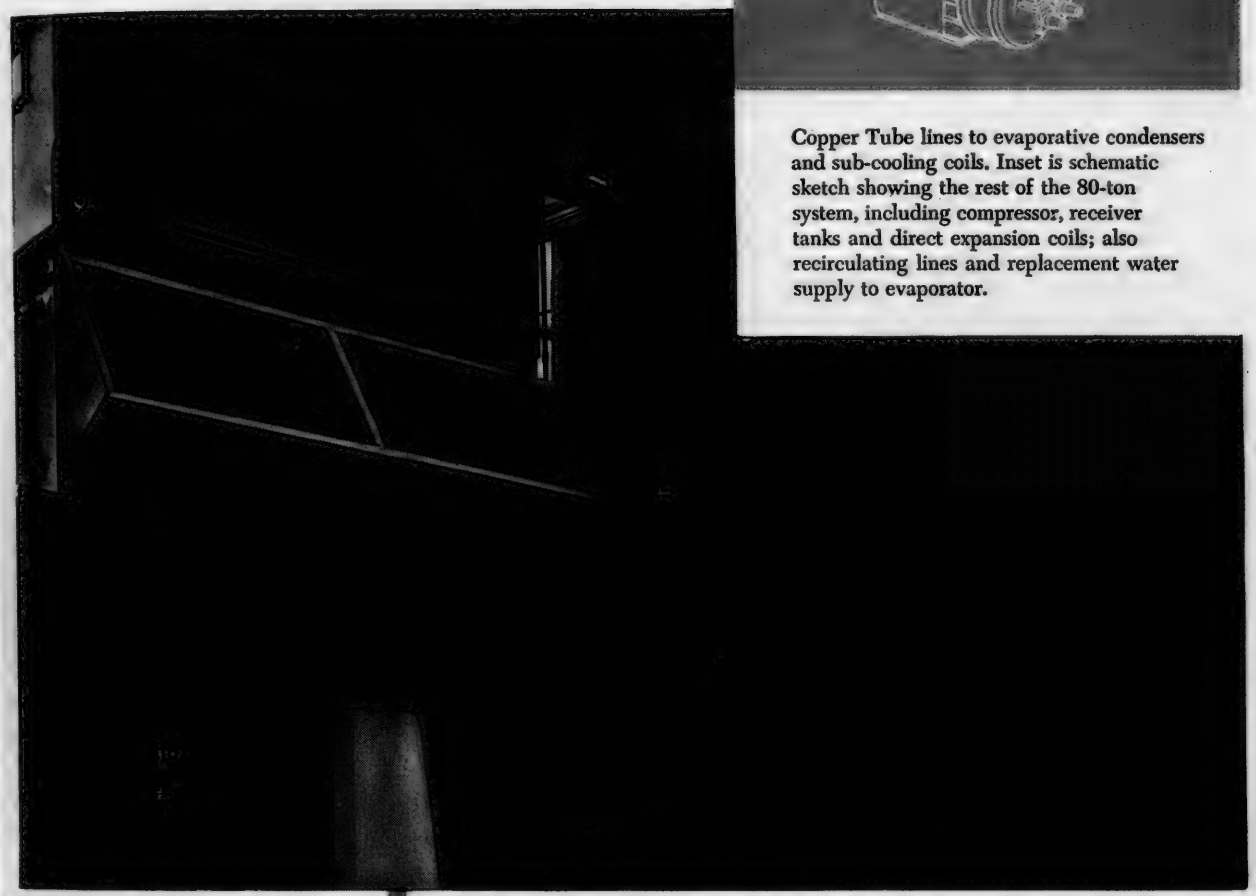
Centrifugal Fan Unit Heaters

Ask Your Wholesaler or Write

AIRTHERM MANUFACTURING COMPANY
722 South Spring Avenue • St. Louis 10, Missouri

ANACONDA All-Copper refrigeration piping cuts installation costs





Copper Tube lines to evaporative condensers and sub-cooling coils. Inset is schematic sketch showing the rest of the 80-ton system, including compressor, receiver tanks and direct expansion coils; also recirculating lines and replacement water supply to evaporator.

ANACONDA PRODUCTS FOR THE REFRIGERATION INDUSTRY

Copper Tubing
Restrictor Tube
Bourdon Tube
Thermal Expansion Bulbs
Formed Tube Parts
Hard Copper Tube cut to length
Copper Water Tube in coils or straight lengths
Fittings
Vibration Eliminators
Flexible Metal Conduit

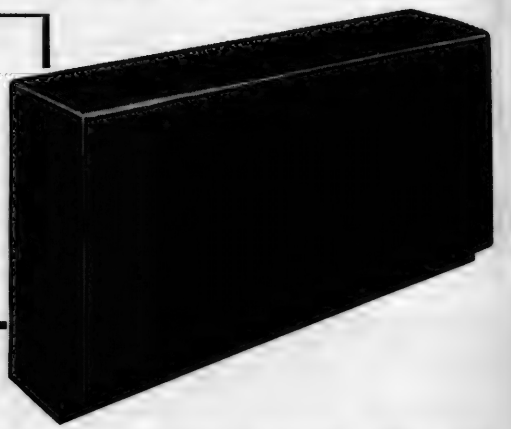
Pictured here is part of an air conditioning system recently installed in a large office building. Noteworthy is the fact that ANACONDA Copper Refrigeration Tubing, ANACONDA Wrought Copper Fittings and American Vibration Eliminators were used throughout. This lightweight tubing with solder-type fittings was selected because of its easy installation and lower labor costs. Also important was the fact that copper tubing is non-rusting and corrosion-resistant and therefore ideally suited for water and refrigerant lines.

If you are concerned with the design or installation of an air conditioning or refrigeration system, you'll find it pays off in long-time dependable service to specify ANACONDA Refrigeration Products. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

for consistent uniformity—ask for ANACONDA® refrigeration products

Simple, efficient, easy to install . . .

The REMOTAIRE
by
AMERICAN-Standard



- Year 'round heating and cooling
- Central plant, multi-room installation
- Individual room temperature control
- Filters and circulates the air
- Single piping circuit

Remotaire installations are simple and direct. The same piping circuit carries chilled water for summer cooling, hot water for winter heating. There is no bulky ductwork. Water is conditioned in a central plant, yet temperatures can be controlled individually in each room where a unit has been installed.

Remotaire units have reversible coils for right or left hand connections. And each part of the unit is easy to get at.

To meet all types of installation requirements Remotaire units are available in 200, 400, and 600 cfm capacities.

Your customers will like the Remotaire. Heating and cooling performance is outstanding. The installation looks good, too. Units come in handsome semi-gloss Cooltan jackets but can be painted to match the room interior if desired. Remotaire units can be installed free standing, partially recessed, or totally recessed.

Contact your local American-Standard sales office or your wholesale distributor for more information about Remotaire performance and installation, or write for literature—Form 417.

THE REMOTAIRE IS VERSATILE. An example of a Modernization System is the Park Sheraton Hotel of New York. The above rendering shows how simple the Remotaire piping is. Picture below illustrates our attractive Remotaire unit in a Park Sheraton Hotel room.

AMERICAN-Standard
HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, Dept. HV-54, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

CAUSE FOR ACTION!

PUMPS NEEDED IN A HURRY . . .

AIR FORCE RUSHES SHIPMENT TO BASE

ABOVE: Two-motor cargo plane lands at local air field to pick up rush shipment of ten Skidmore "HS" boiler feed pumps, needed at once, by east coast air base.

See Bulletin 14-A for full description of this outstanding Skidmore Pump

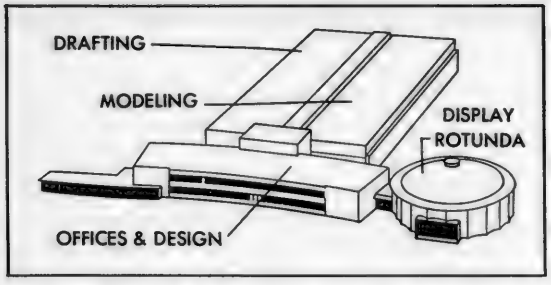
Here again, "proven performance" was the answer . . . when the Army needed a dependable, low cost pump in a hurry—they specified the Skidmore Type "HS" Pump. Yes, the Army knew from past experience what they were getting—and how soon. Take the *guess work* out of your pump program . . . specify a dependable Skidmore Pump on your next installation.

SKIDMORE PUMPS

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

Advanced Styling Section of Ford Motor Company's new $11.5 million Styling Building, Dearborn, Michigan.

Ford "dream shop" has built-in climate!



The design-office wing and display rotunda are served by a central system. It includes: 7 supply fans; 34 exhaust fans; heating and cooling coils and sprayed-coil dehumidifiers — all furnished by American Blower.

Air for drafting rooms and modeling studios is conditioned by 24 specially built, automatically controlled American Blower Air-Conditioning Units. Each unit contains heating and cooling coils and capillary air washers.

This "dream shop" at the Ford Engineering Staff's Advanced Styling Section is just one of many styling areas which depend on clean, conditioned air.

For example, in 12 roomy studios clay-modeling teams work under lights which produce shadowless illumination — and intense heat! To absorb this heat and provide the proper climate for working with clay models, specially designed air-conditioning systems were installed for each studio and drafting room. American Blower Air Handling and Air-Conditioning Equipment was used for this unusual assignment.

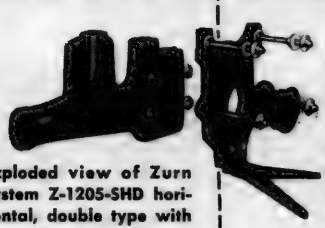
The expert know-how of American Blower engineers is on tap for industry at all times. If you have an air-handling or air-conditioning problem, phone your nearest American Blower or Canadian Sirocco Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

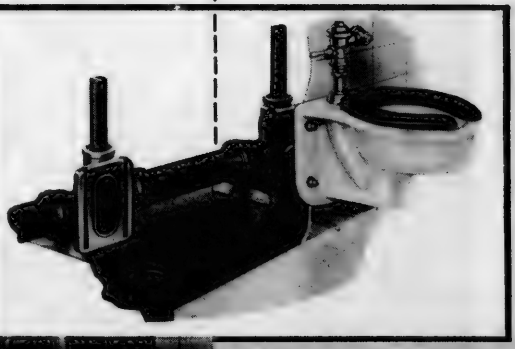
Serving home and industry:
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONING

ZURN systems*...
for installing
off-the-floor plumbing fixtures
yield time-cost savings



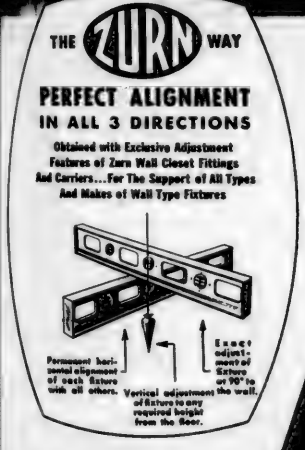
Exploded view of Zurn System Z-1205-SHD horizontal, double type with connection for soil pipe, for back to back installation of syphon jet closets. Also available for threaded pipe connections.

Syphon jet closet carrier face plate with universal adjustable fixture bolts and corrosion resistant adjustable coupling.



Zurn System—horizontal, single type with soil pipe connection for installation of wall type toilets.

Installation for back-to-back syphon jet toilets in school washroom using Z-1205-SHD Zurn System.


THE ZURN WAY
PERFECT ALIGNMENT
IN ALL 3 DIRECTIONS
Obtained with Exclusive Adjustment Features of Zurn Wall Closet Fittings And Carriers...For The Support of All Types And Makes of Wall Type Fixtures
Permanent horizontal alignment of each fixture with all others.
Vertical adjustment of fixture to any required height from the floor.
Exact adjustment of fixture at 90° to the wall.

The flexibility of the Zurn System for installing wall-type fixtures gives relief from time-wasting grief, assures speed in assembly and accurate alignment of fixtures in all three directions during installation; rigid water-tight connections insure minimum final adjustments when installing wall-type toilets; bulk of assembly can be precut in shop; unique waterway allowing a 4" vertical adjustment does away with numbered fittings.

Installations with the Zurn System are above the floor, behind the toilets, behind the wall. There are no delays waiting for other crafts. A Zurn System is available for all makes and types of wall-type plumbing fixtures—lavatories, urinals, toilets, sinks, or other off-the-floor plumbing fixtures. Write for free booklet, "You Can Built It and Maintain It For Less A NEW WAY".

Over 700,000 Wall-Type Fixtures now installed with ZURN SYSTEMS in Buildings of Every Type from Coast to Coast. Write for list of Buildings having washrooms with fixture-bare floors.

J. A. ZURN MFG. CO. • PLUMBING DIVISION • ERIE, PA., U. S. A.

Sales Offices in All Principal Cities • *In Canada:* Canadian Zurn Engineering Ltd., Montreal, P.Q.

OTHER DIVISIONS OF THE ZURN ORGANIZATION:

MARINE DIVISION: Fluid Control and Piping Equipment • *INDUSTRIAL DIVISION:* Strainers for Pipe Lines • *AFFILIATE:* American Flexible Coupling Company, Amerigear Couplings with Fully Crowned Teeth

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*T. M. Reg.
U. S. Pat. Off.

ZURN

PLUMBING DIVISION PRODUCTS INCLUDE EVERYTHING FOR DRAINAGE SYSTEMS FROM ROOF TO BASEMENT

Greaseptor.

Area Floor Drain.

Roof Drain with Internal Expansion Joint; High Velocity Drainage.

Backwater Valve Non-Fouling.

Supremo Perfect Seal Floor Level Cleanout.

One of several types of Zurn Systems for wall-type urinals.

J. A. ZURN MFG. CO., *Plumbing Division*
Erie, Pa., U. S. A.

Please send me the new Zurn booklet, "You Can Build It and Maintain It For Less A NEW WAY".

Name and Title .....

Company .....

Street .....

City and State .....

Please attach coupon to your business letterhead
Department DE-722

Vinyl-faced Super·Fine minimizes possibility of condensation on fresh-air intake ducts. L·O·F Super·Fine's ease of application reduced installation costs for Johnson John-R Insulation Co. of Detroit.

Give your insulating jobs these advantages with L·O·F Super·Fine

Reduced installation time! — L·O·F Super·Fine insulating blankets are lightweight, pliable, easily cut, handled and installed. No special cutting tools! No time-consuming shaping or fitting! Super·Fine conforms to irregular contours or projections. The result:—easier, faster installation.

Increased over-all efficiency.—Super·Fine is superior insulation in its resistance to heat flow. Saves fuel on heating ducts, power on cooling ducts. Increases over-all efficiency of both systems. These fine glass fibers will not burn, absorb moisture, mildew or rot. Available with various types of vapor barriers for temperatures to 450° F., and with special binder for temperatures to 600° F.

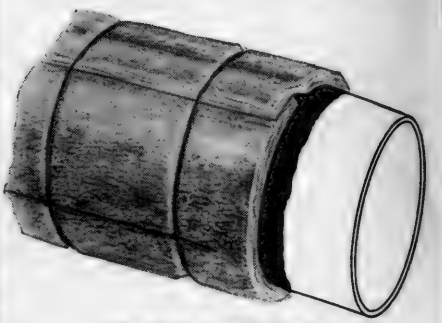
Quality product backed by Libbey·Owens·Ford!—Super·Fine is backed by Libbey·Owens·Ford—long famous for outstanding glass products—your guarantee of top-quality insulation.

L·O·F GLASS Corning FIBER·GLASS

FIBER · GLASS

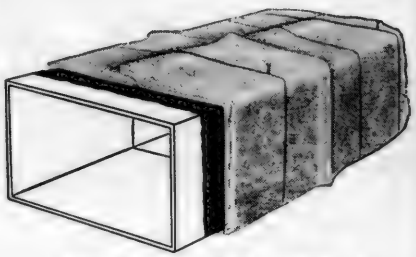
LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

How to install Super·Fine on cooling and heating ducts



CIRCULAR DUCTS

Super·Fine conforms easily to curved surfaces. After adhesive is applied, Super·Fine is simply wrapped and secured with tying cord, light wire or staples. If staple method is followed, use in combination with adhesive. Allow sufficient overlap on larger ducts to stagger staples.



RECTANGULAR DUCTS

Super·Fine is wrapped around surface with 3″ overlap. Ends can be butted or lapped. Secure with light-gauge tie-wire or Fiber·Glass tying cord or use staple method—allowing sufficient overlap on large ducts to stagger the staples. Super·Fine is also used as duct liner in air-conditioning ducts to reduce sound in middle- to high-frequency ranges.

FREE! Helpful folder gives detailed instructions for installation of Super·Fine on metal ducts. Write Libbey·Owens·Ford, Fiber·Glass Division, 3154 Wayne Building, Toledo 3, Ohio.

For all-weather comfort FINE STORES depend on JOHNSON CONTROL

Lytton's, Henry C. Lytton & Co., Evanston, Illinois. Shaw, Metz and Dolio, architects and engineers, Chicago; Wanzenberg Heating Co., heating contractors, Evanston.

Johnson Steam Valve (in center), positioned by T-800 Thermostat (not shown), controls steam supply to reheat coil. Johnson Damper Operators control the zone mixing dampers.

T-800
Remote Bulb
Thermostat

V-103
Coil Valve

D-251
Piston Damper
Operator

T-400
Room
Thermostat

V-108
Three-way
Mixing Valve

Henry C. Lytton's modern store in Evanston, Illinois, like so many of the nation's fine stores, depends on Johnson Control for all-weather comfort.

With Johnson Control in command, the heating and air conditioning systems are under complete and precise control at all times to insure the ultimate in shopping comfort. In addition, Johnson controlled snow melting equipment keeps walks free of snow and ice throughout the winter months.

The accuracy and flexibility enjoyed at Lytton's Evanston store are typical of Johnson Control Systems, because each one is specifically designed *and installed* by Johnson to meet the needs of the individual control problem. That is why you will find Johnson *Planned-for-the-Purpose, Installed-for-the-Purpose* Control, not only in leading stores, but in every type of public, commercial and industrial building.

The nearly 70 years of experience of the nationwide Johnson organization is at your disposal without obligation. Why not let a Johnson engineer from a nearby branch office solve your temperature control problems? JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURING • PLANNING • INSTALLING • SINCE 1885

EBKO
PIPING SYSTEMS

CAST IRON STEEL

Note Lockseam, spirally welded steel casing. This feature of EBKO conduit increases its strength and resistance to crushing weights by many times.

The EBKO pressure test-proved prefabricated insulated piping system, for underground and overhead distribution of steam, water, and refrigerants, offers the most advanced features in design and engineering.

This product of many years of engineering experience and research is the FIRST system capable of being fully guaranteed.

—It is the FIRST system mechanically-sealed.

—The FIRST to provide an insulated system capable of maintaining normal efficiency when totally submerged.

—The FIRST to provide a complete drainage and relief system within itself.

—The FIRST absolutely fireproof system.

—The FIRST to make possible the removal of the inner pipe assembly, with supports and insulation, in sections without taking up the entire system.

These and other features make EBKO Piping Systems the leader today. Yet their cost is no greater than that of other types. Accordingly, you can have the best and enjoy the security and peace of mind they bring with them.

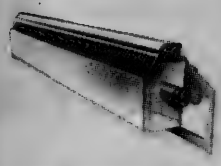
EBKO Systems are furnished in all sizes, for all working pressures and temperatures. Write today for our EBKO Data Book.

E. B. KAISER CO.

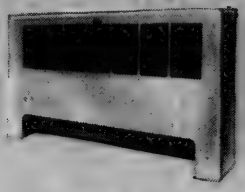
Since 1890

2114 West Lake Avenue • Glenview, Illinois
P. O. Box 276

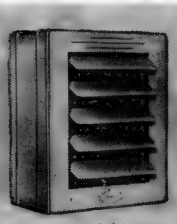
Representatives in principal cities



Florvector* Baseboard Heating



Convector-Radiator



Horizontal Unit Heater

Down Blow Unit Heater

*Trademark

UNARCO®

year 'round weather conditioning

World's finest heating and cooling products in a complete range of types and sizes

UNARCO Quality engineered

Dependable performance UNARCO

UNARCO Priced to sell UNARCO

Eight manufacturing plants UNARCO

31 sales offices

UNARCO Get the facts before you buy

self-contained highboy

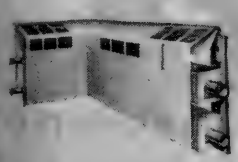
2, 3, 5, 7½, 10 and 15 ton cooling capacities.

Heating capacities up to 450,000 BTU per hour.

All UNARCO Products are available in Canada.

UNION ASBESTOS AND RUBBER COMPANY

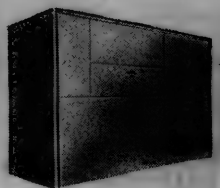
332 SOUTH MICHIGAN BLVD. • CHICAGO 4 • WEBSTER 9-5444



Wall Radiation

Furnace Air Conditioner

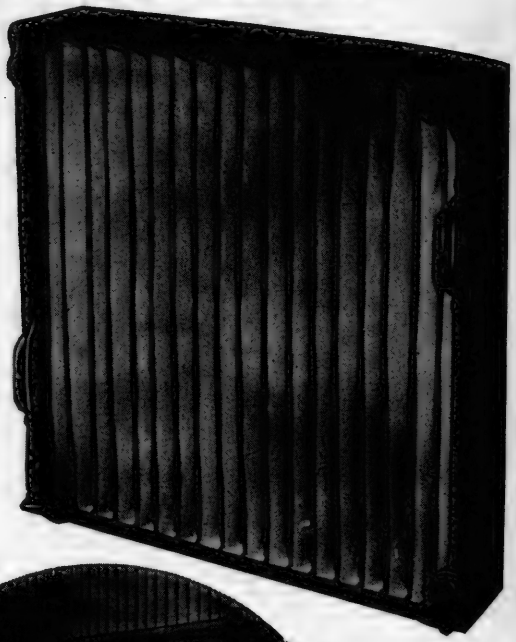
Mobile Air Conditioner



AEC Air Conditioner

THERE'S A STAYNEW VENTILATION PANEL FILTER

FOR EVERY TYPE OF COMMERCIAL AND INDUSTRIAL SERVICE



Ventilation and air conditioning engineers recognize the Model WKE dry-panel filter as the most efficient unit of its kind on the market today. Wide range of media is available — it operates at maximum efficiency with any medium that comes in sheet form and can be crimped. Because of its extreme versatility, the Staynew WKE filter may be used for hundreds of varied applications.

- Greater filtering area, size for size, than competitive panels.
- Construction permits wide selection of filtering media.
- Wire screen cloth front and back of medium eliminates "sagging" and protects it so that even the most fragile materials can be cleaned over and over again.
- Can be cleaned quicker than any other type panel.
- Can be washed or dry cleaned when necessary.
- Medium can be replaced quicker than in any other panel.

Inexpensive disposable media can be furnished, if desired.

MODEL WKE Dry Panel Filter Available in 2", 4", and 8" Deep Units

One exclusive advantage with the Staynew WKE is that it can be easily vacuum-cleaned in place. Saves time—reduces maintenance costs.

For complete information write today for Bulletin DPF-100.

Representatives in Principal Cities

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

15 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

How Sarco dependability builds business for you—cuts your costs

Satisfied customers order Sarco Steam Specialties time and time again

There's a sound reason why so many plant engineers, maintenance men, architects, consulting engineers and contractors specify Sarco products over and over again.

That reason is Sarco *dependability*!

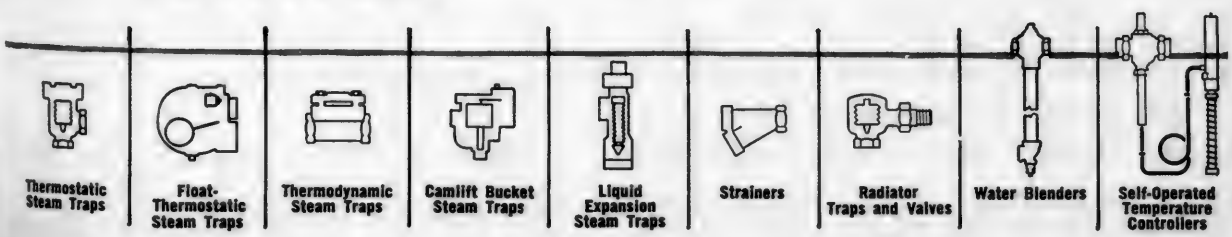
To the distributor, this dependable, trouble-free service means satisfied customers... and satisfied customers mean steady repeat business—more profit!

Make sense? Write today for more information on how much more profitable it is to sell Sarco. Contact your local Sarco representative, or write direct to Sarco Company, Inc., Empire State Building, N. Y. 1, N. Y.

ANOTHER REPEAT ORDER FOR SARCO
now another Ford Plant
equipped with Sarco heating specialties
18 years of repeat orders
and now again...
SARCO SAVES STEAM
21 times in two years
Buckart Engineering Corporation Specifies Sarco Heating Specialties for School Projects
SARCO
First in 1930 and SEVEN times since
SARCO

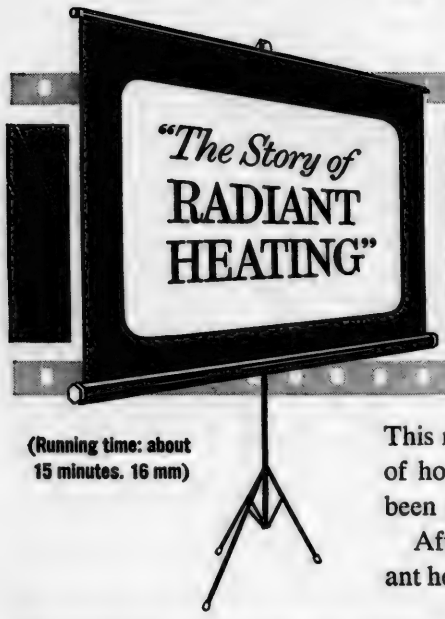
Proven dependability plus 43 years of consistent advertising have made Sarco products nationally known and preferred.

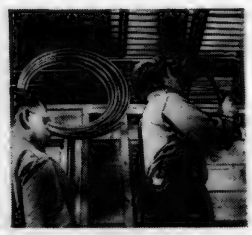
SARCO *A Complete Line of Steam Traps ~ Heating Specialties ~ Strainers ~ Temperature Controllers*



You'll want to see these 2 NEW CHASE MOVIES!

Both in full color and sound





(Running time: about 15 minutes. 16 mm)

This movie tells the fascinating story of how nature's way of heating has been put to work for man.

After explaining the *theory* of radiant heating with interesting animated sketches, it takes you along on a typical installation trip—and shows you every important phase of a ceiling and floor slab installation from start to finish.

The drainage system is the most important health precaution in the home. This movie shows how copper soil, waste and vent lines are installed with less effort...quicker and neater...and at no extra cost.

You'll see a typical system being installed in a typical home. You'll see the whole job—from initial selection of copper tube and solder-joint fittings...to the final testing of the finished job.

(Running time: about 11 minutes. 16 mm)

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Visit Chase Booth 563 at the Annual Convention, National Association of Plumbing Contractors, National Guard Armory, Washington, D. C., May 10 to May 13.

TO ARRANGE A SHOWING

These movies are available to Plumbing and Heating Wholesalers, Plumbing and Heating Contractors, Building Contractors, Architectural Schools and Associations, Trade Schools and others interested in plumbing and heating. Make arrangements through any Chase Plumbing and Heating Wholesaler or Chase Sales Office.

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

This is why you should always specify and buy

ANEMOSTAT

Air Diffusers

The largest selection of sizes and types for conventional or High Velocity Systems.

Proven performance and design for every engineering and architectural need.

A consistent record of prompt delivery and customer satisfaction.

ANEMOSTAT®

DRAFTLESS *Aspirating* **AIR DIFFUSERS**

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39th STREET, NEW YORK 16, N. Y.

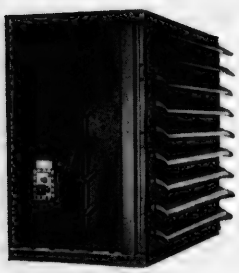
REPRESENTATIVES IN PRINCIPAL CITIES

"No Air Conditioning System Is Better Than Its Air Distribution"

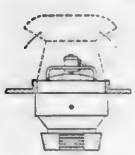
When air is exhausted from paint spray booths, from grinding, casting, chemical processing or other plant operations or is used in combustion, it must be replaced. Wing Fresh Air Supply Heaters provide the finest means of replacing exhausted air and supplying fresh air at the right temperature, winter and summer.

WING FRESH AIR SUPPLY HEATERS

require no extensive duct work. They are mounted in window or wall openings or below roof or monitor openings.



WING FRESH AIR SUPPLY HEATER for Window or Wall Mounting



At left is shown Fresh Air Supply Heater for mounting in roof or monitor opening.

Write for Bulletin

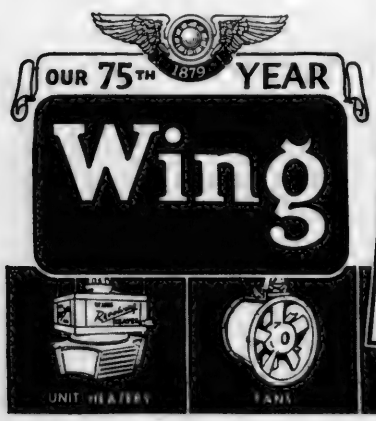
HOW THEY WORK. They draw in the outside air at prevailing outside temperature and pass it through multiple by-passes and heating elements which are always under full steam pressure.

THEY CANNOT FREEZE. The heating coils can never freeze as they can where temperatures are controlled by throttling the steam supply.

UNIFORM DISCHARGE TEMPERATURES. The discharge airstream is uniform in temperature because of Wing's unique design and construction which combine several alternating by-pass and hot air passages. The multiple thin layers of hot and cold air mix almost instantly assuring uniformly warm air at the outlet.

L. J. Wing Mfg. Co. 158 Vreeland Mills Road, Linden, N.J.

Factories
Linden, N.J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium



SEVENTY-FIVE YEARS AGO
Three years before 1879, when the L. J. Wing Mfg. Co. was founded, President Grant and the Emperor of Brazil started the great Corliss Engine shown above, thereby opening the great Centennial Exposition in Philadelphia, symbolizing the new industrialism that was to transform America and the world.
BLOWERS
DRAFT INDUCERS
TURBINES

MOTORIZED CHIMNEY DRAFT

with the WING DRAFT INDUCER

No boiler can operate satisfactorily or efficiently over wide ranges of weather or load with variable natural draft. The fuel—whether oil, gas or coal—must have enough oxygen for complete combustion. There must be sufficient draft or furnace fires will be slow burning and lifeless, resulting in uneven, insufficient and irregular heat.

WING Draft Inducers insure positive, adequate, uniform draft regardless of variable weather conditions or inadequate chimney or breeching construction.

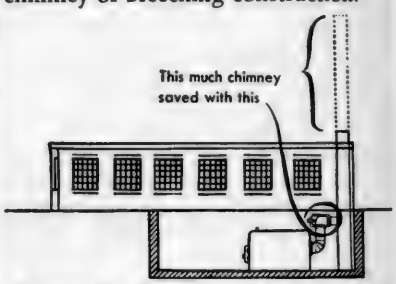
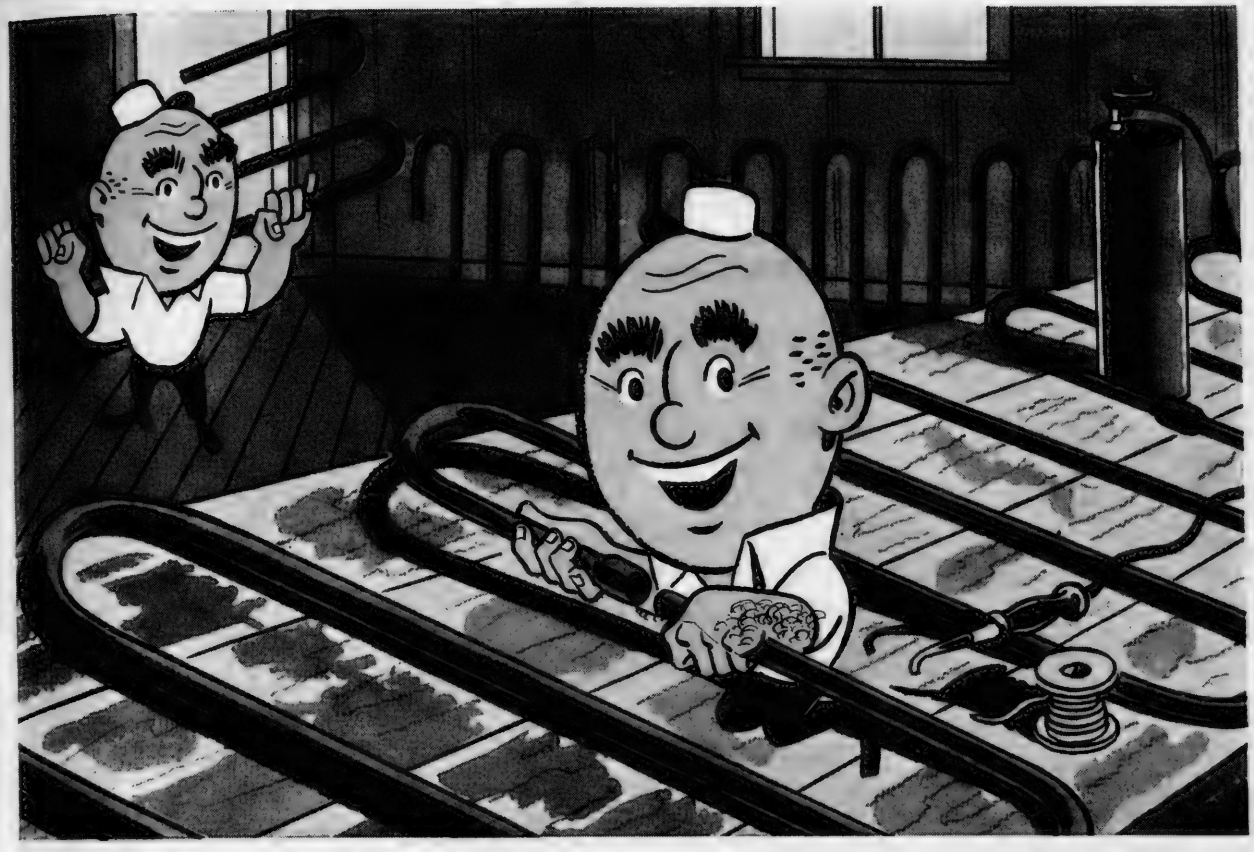


Diagram above shows how much chimney is saved by installing Wing Draft Inducers.

Wing Draft Inducers are suitable for use in connection with oil, gas, stoker-fired or hand-fired heating boilers, industrial furnaces or kilns, or high pressure steam boilers, either stationary or marine. Sizes are available for boilers as low as 1000 sq. ft. E. D. R. up to steam generators producing 100,000 pounds of steam/hr. Special, heavy duty designs available for these larger boilers.

Wing Draft Inducers are made in two types—for insertion in breeching or flue, or for installation on top of a chimney. Write for a copy of Bulletin I-52 to L. J. Wing Mfg. Co., 158 Vreeland Mills Road, Linden, New Jersey.



Gain top performance, lower cost in ceiling radiant heating systems

Performance-proved in thousands of radiant heating systems, Bundyweld Tubing brings you not only top performance, but appreciable savings in material costs and fabrication time as well.

Check these plus-features: Bundyweld is extra-strong, yet ductile; bends easily to short radii on a simple fixture in the shop or at the job site. It comes in standard, 20′ lengths with one end expanded, when specified, for simpler, sounder joining.

Bundyweld can be handled pretty roughly without danger of damaging it, too. It's lightweight enough (100′ of ⅜″ O.D. weighs only 10 lbs.) and rigid enough so that two men can easily position a group of joined coils. Then, the smooth, flat-lying coils can be speedily plastered, with no waste motion, no waste material.

In your completed system, Bundyweld transmits heat efficiently, conducts water with a minimum of friction. Just check below to see why Bundyweld is the only tubing that can offer you all these advantages. Then write us today for more information.

Radiant Heating Division
Bundy Tubing Company • Detroit 14, Michigan

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of steel which is copper-coated. Then, it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal. Result . . .

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

Here's why more and more of America's famed buildings are installing the Yorkaire system of air conditioning

The YORKAIRE SYSTEM brings new standards of comfort to the modern miracle of air conditioning, yet see how simple it is, how easy to understand! . . .

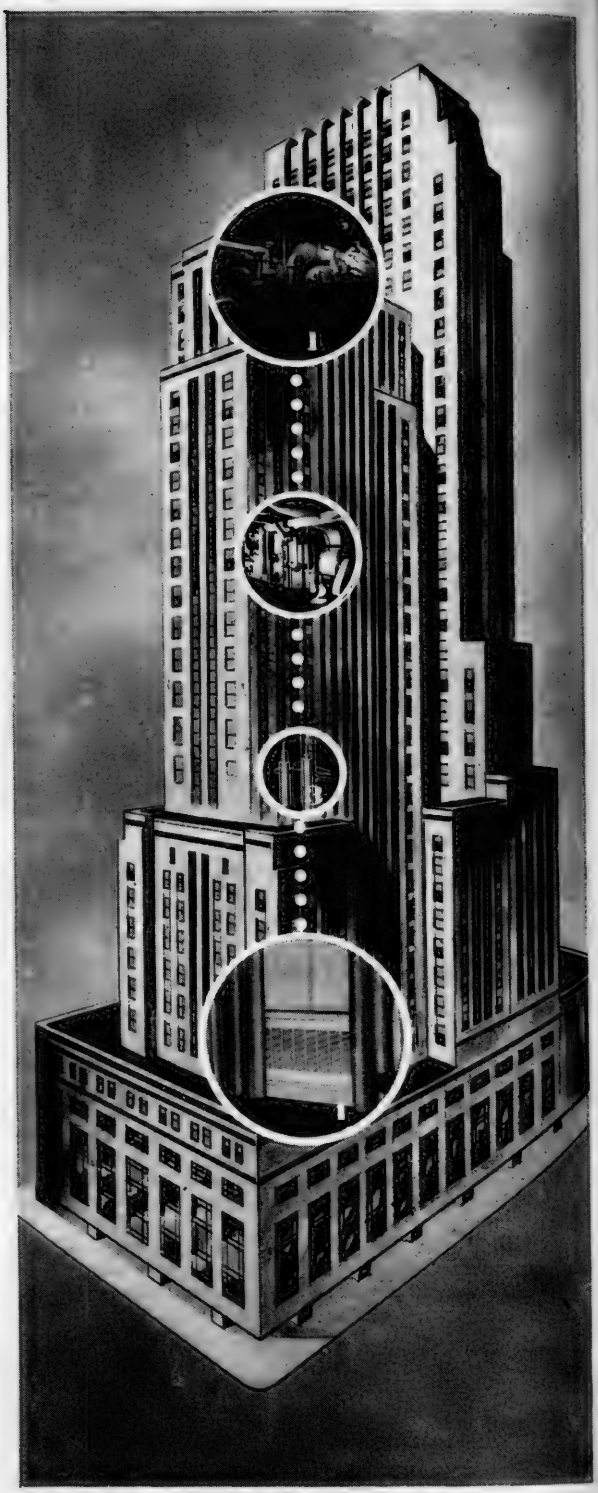
1. Source of comfort cooling is the famous and rugged York Turbo Water Cooling System which may be located on the roof of the building or in the basement.

2. Great volumes of air are brought into the building from outdoors at convenient points. This "raw" air is filtered, washed, cooled or heated, and conditioned for the right amount of moisture. When it's "just right for comfort," it begins its swift, silent journey to you.

3. Through small, space-saving, tightly sealed tubes the conditioned air is sent under mild pressure, branching out at each floor to the individual rooms. At the same time, small pipes carry hot water in winter and cold in summer to help you obtain the temperature you want.

4. In room units under the windows the air tube and water pipes converge. These units distribute the conditioned air in a gentle, quiet stream. A simple control allows you to refine the temperature to the conditions you desire, with no mixture of air from other rooms.

YORKAIRE SYSTEMS of Air Conditioning are being installed in building after building, old and new, across the country.



air conditioning by york

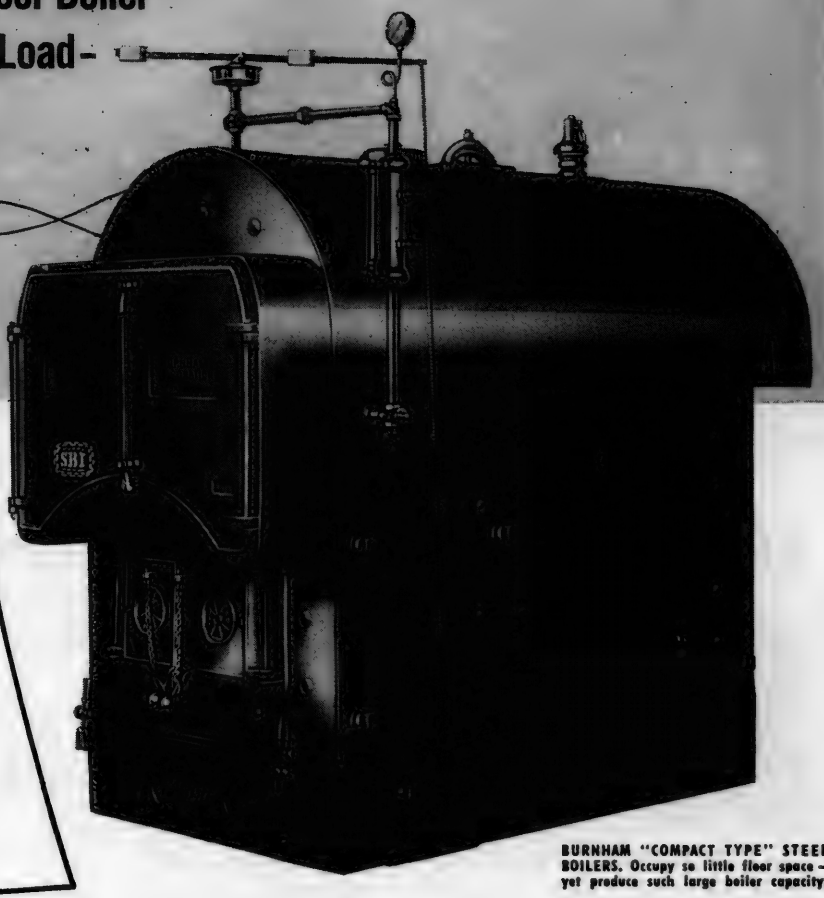
. . . Recent contracts include these famous buildings—Mile High Center, Denver; Netherland-Plaza Hotel, Cincinnati; Fulton National Bank, Atlanta; Equitable Life Assurance Society, San Francisco; Esso Standard Oil Company, Philadelphia. If you are not now enjoying this healthful comfort, perhaps you will, sooner than you think.

YORK CORPORATION York YORK, PA.

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

BURNHAM STEEL BOILERS ARE RATED RIGHT!

...Every BURNHAM Steel Boiler is Rated for Nominal Load– NOT Top Capacity



This *Quickly* adds up to:

Greater Dependability

Longer Useful Life

Greater Efficiency

Greater Safety

Lower Costs

BURNHAM "COMPACT TYPE" STEEL BOILERS. Occupy so little floor space — yet produce such large boiler capacity.

HERE'S WHY

Conservative oldtimers are not deluded by "top capacity" ratings for a boiler. They know from long experience that only *nominal-rated* boilers give them the reserve which makes for greater efficiency, lower maintenance and longer useful life. Nominal-rated boilers mean protection against fluctuating loads, emergencies and expansion.

BURNHAM STEEL BOILERS are *all* nominal-rated, a fact you can prove for yourself or which we will gladly prove to you. They all conform fully to SBI ratings. The selection of a BURNHAM BOILER has many times been the difference between a good buy and a costly mistake. When you buy or specify a BURNHAM "COMPACT TYPE" STEEL BOILER, you automatically avoid any chance of unsatisfactory performance, arising from rating misunderstandings.

Burnham RADIANT HEATING

Burnham Corporation SBI

BOILER DIVISION

Irvington **New York**

HV-54

BURNHAM CORPORATION
Boiler Division
Irvington, New York

Please send me 8 page catalog with NOMINAL-RATINGS on BURNHAM "COMPACT TYPE" STEEL BOILERS.

Name_____

Address_____

City_____ State_____

NEW OFFICE BUILDING FOR SPRINGMAID.
Architects and Engineers: Robert & Company Associates, Atlanta, Ga.
General Contractors: George A. Fuller Co., New York, N.Y.
Heating Contractors: Standard Engineering Co., Inc., Washington, D.C.

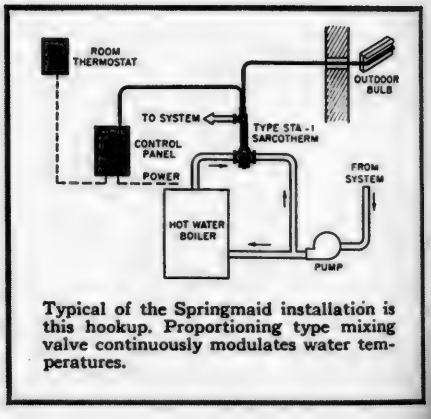
SARCOTHERM *Controls Radiant Heating System in Springmaid's Unique Home Office*

UPSIDE-DOWN WINDOWS, "floating" ceilings, and radiant heated walls tell the story of Springs Cotton Mills' remarkable new building in Fort Mill, S. C.

Sarcotherm weather modulated controls were specified for the building's unusual heating system which operates through radiant panels installed in the walls. The system is divided into seven zones, each of which is regulated by a Sarcotherm Indoor-Outdoor control. Thus each zone is assured comfort regardless of location and outside temperature conditions.

Sarcotherm provides a simple, low-cost way of achieving accurate, sensitive control of radiant and hot water heating systems. Coupled to these distinct advantages is Sarcotherm's extensive engineering service which can help you design and install the most efficient and trouble-free system possible.

A Sarcotherm heating engineer will be happy to talk over your next project with you. For complete details on Sarcotherm weather modulated controls contact your nearest Sarcotherm representative, or write direct to Sarcotherm Controls, Inc., Empire State Building, N. Y. 1, N. Y.



Typical of the Springmaid installation is this hookup. Proportioning type mixing valve continuously modulates water temperatures.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In a Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings and Wiring Diagrams—not just general drawings but complete, tailor-made Sarcotherm drawings and diagrams for each individual job.

On-the-Job Help—your contractor gets Sarcotherm's full cooperation and technical assistance backed by many years of specialized experience.

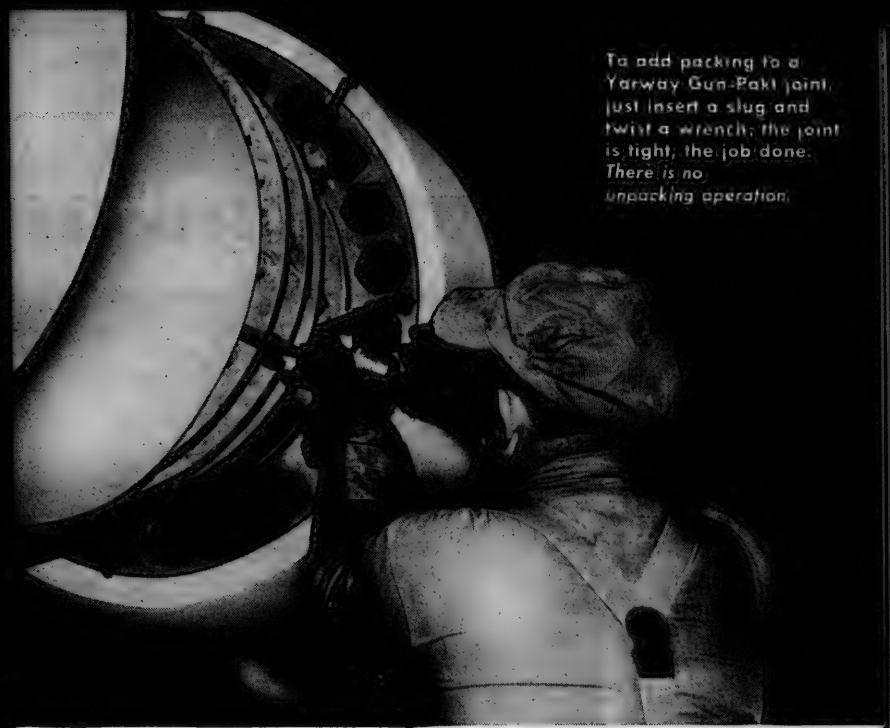
SARCOTHERM CONTROLS, Inc.

An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for Hot Water, Radiant and Steam Heating Systems

STARTLING NEW FACTS ON EXPANSION JOINT MAINTENANCE

It may cost less than you think to service expansion joints. Look at these records from typical users of Yarway Gun-Pakt Expansion Joints:



To add packing to a Yarway Gun-Pakt joint, just insert a slug and twist a wrench; the joint is tight, the job done. There is no unpacking operation.

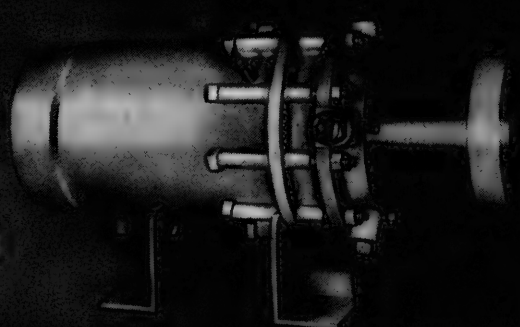
	YARWAY GUN-PAKT JOINTS	CONVENTIONAL GLAND-PACKED JOINTS
STATE UNIVERSITY*	Required addition of only 3 slugs (45 cents) of packing in 5 years. Lubrication only once every 6 months. Total labor time of only 2 manhours in 5 years.	Same lubrication as Gun-Pakt, *plus* gland tightening, *plus* complete overhaul with shutdown for unpacking and repacking every 3 to 4 years. Time for overhaul—25 manhours per joint!
MID-WEST AIRFIELD*	Only maintenance was lubrication and addition of 2 slugs (30 cents) of packing per year. Total labor ¼ manhour per joint per year.	Lubrication and gland tightening required 8 manhours per joint per year—plus complete unpacking and overhaul every 2 to 3 years. Time required for overhaul—20 manhours per joint.
"BIG TEN" UNIVERSITY*	Lubrication only once every 2 months, with packing added as needed. Total labor time charged, 1 manhour per joint per year.	General maintenance requires 6 manhours per joint per year. Complete overhaul required every 2 to 3 years with unpacking and repacking—24 manhours per joint.

*Names on request.

To get the full facts on Yarway Gun-Pakt Expansion Joints, and how they can save maintenance money, write for Yarway Bulletin EJ-1913.

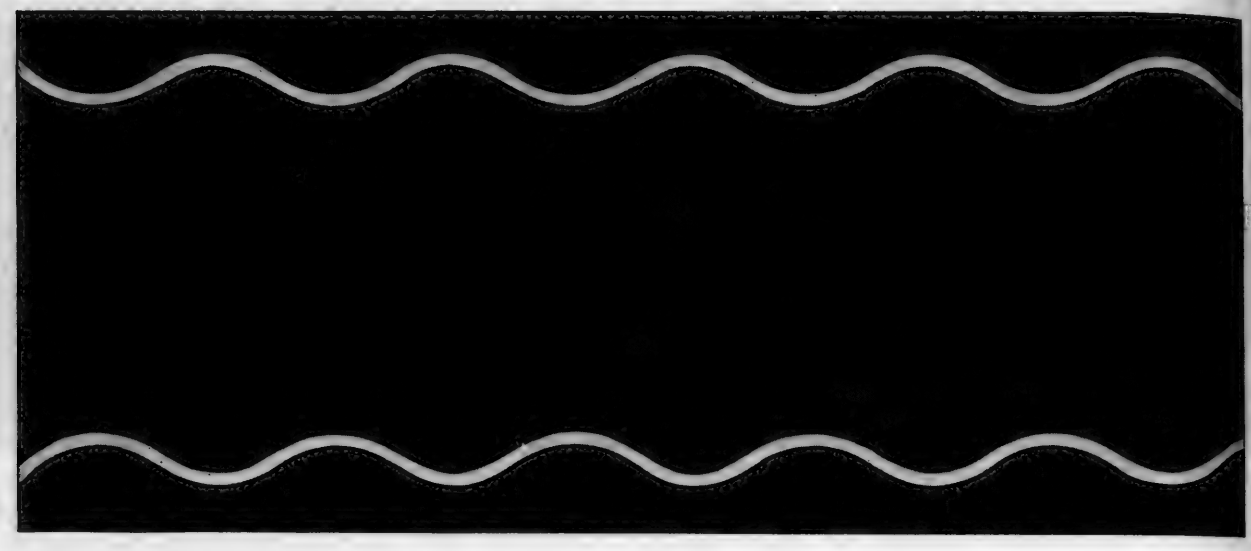
NALL-WARING COMPANY
Mermaid Ave., Philadelphia 18, Pa.

Yarway single-end, welding type Gun-Pakt joint for pressures to 300 psi; heavier design for higher pressures. Single-end traverses up to 12 inches; double-end up to 24 inches.



gun-pakt expansion joints

Introducing *Continental's* Spinning Gas Technique*



*In the Continental, air is forced through static turbine-like vanes which cause air to enter the furnace with a spinning motion. This technique achieves thorough mixing of air and atomized fuel, better combustion, a slower passage of hot gases through the furnace, and a greater amount of heat transfer. On the second pass, gases are spun again by means of a stationary impeller in each 3" return tube. So much heat is transferred by the two-pass design and spinning gas technique that an independent engineering firm found operating efficiency of the unit under test to be 84.23%... with steam quality at 99.43%.

Through use of the spinning gas technique the Continental Automatic Boiler achieves full combustion and over 80% efficiency by means of a two-pass design . . . Due to this technique and design the Continental costs little to maintain, gives long service life, and results in fuel costs equal to, if not lower than most other type packaged units.

Owners report that they can open a Continental for cleaning or inspection in less than a half hour—due to the hinged doors on both ends. Another owner reports fuel savings of 25%—the result of Continental's spinning gas technique and improved design.

For full details on the many exclusive features and advantages of the Continental Automatic Boiler—units from 20 to 500 hp; 15 to 200 lbs. W.P.—write for new Bulletin BE3.

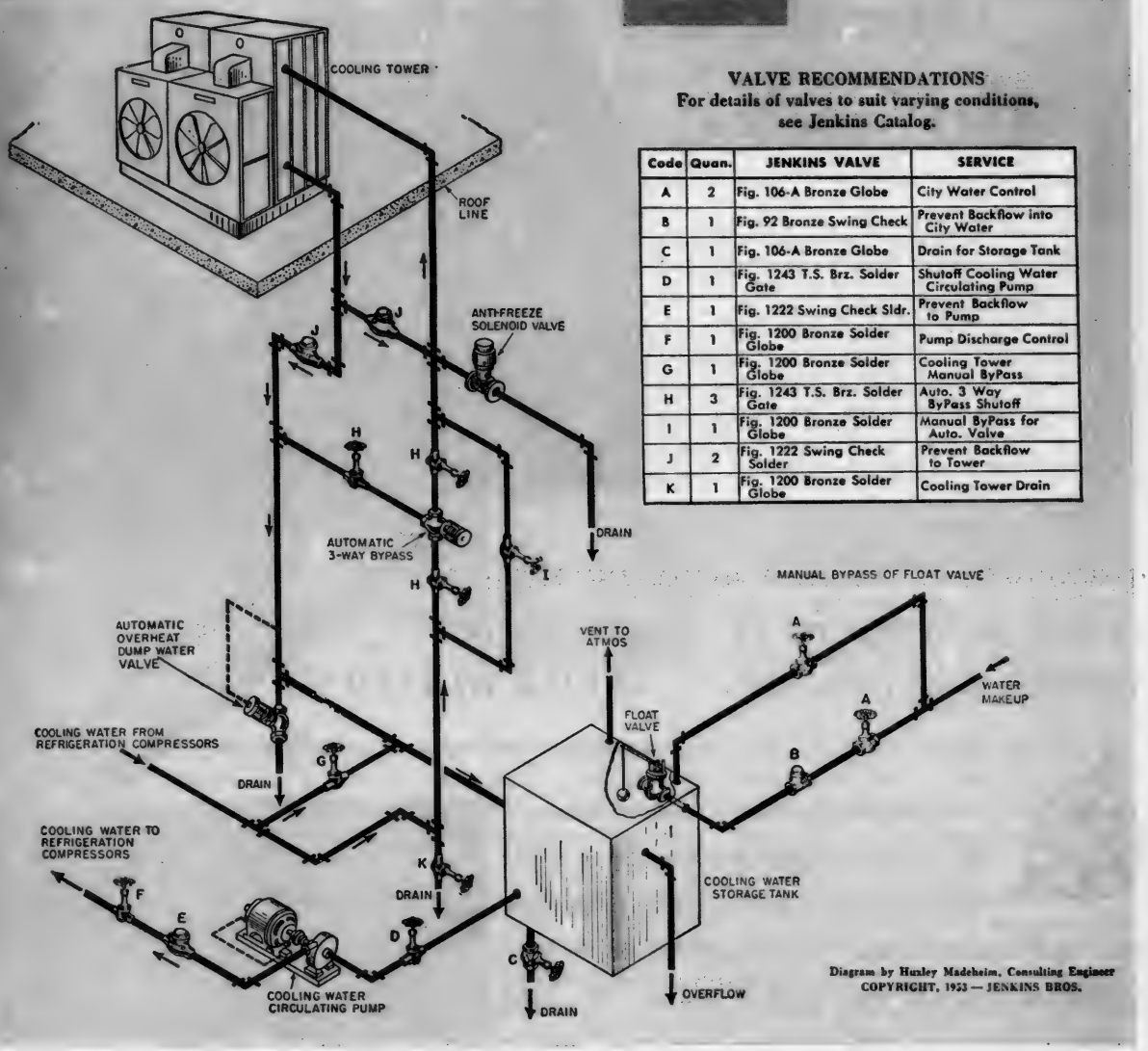
CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY COMPANY, INC.
Phoenixville, Pennsylvania

40 YEARS OF BOILER MANUFACTURING EXPERIENCE

CONTINENTAL is sold, installed and serviced by competent distributors throughout the U.S.

JENKINS PRACTICAL PIPING LAYOUTS

71



VALVE RECOMMENDATIONS
For details of valves to suit varying conditions, see Jenkins Catalog.

Code	Quan.	JENKINS VALVE	SERVICE
A	2	Fig. 106-A Bronze Globe	City Water Control
B	1	Fig. 92 Bronze Swing Check	Prevent Backflow into City Water
C	1	Fig. 106-A Bronze Globe	Drain for Storage Tank
D	1	Fig. 1243 T.S. Brz. Solder Gate	Shutoff Cooling Water Circulating Pump
E	1	Fig. 1222 Swing Check Sldr.	Prevent Backflow to Pump
F	1	Fig. 1200 Bronze Solder Globe	Pump Discharge Control
G	1	Fig. 1200 Bronze Solder Globe	Cooling Tower Manual ByPass
H	3	Fig. 1243 T.S. Brz. Solder Gate	Auto. 3 Way ByPass Shutoff
I	1	Fig. 1200 Bronze Solder Globe	Manual ByPass for Auto. Valve
J	2	Fig. 1222 Swing Check Solder	Prevent Backflow to Tower
K	1	Fig. 1200 Bronze Solder Globe	Cooling Tower Drain

Diagram by Huxley Madeheim, Consulting Engineer
COPYRIGHT, 1953 — JENKINS BROS.

How to plan PIPING CONNECTIONS *for a* NON-FREEZE COOLING TOWER

Where uninterrupted refrigeration is a round-the-clock operating requirement, a non-freeze cooling tower of the type illustrated here offers a dependable supply of cooling water at low cost. It also conforms with the water conservation regulations now enforced in many localities.

Since cooling tower and compressors must operate on the same schedule in any continuous refrigeration system—even when temperatures are below freezing—the water used in this system is stored in a vented or open tank located in a heated space, rather than in the conventional pan under the exposed tower.

When freezing weather occurs, an anti-freeze solenoid valve, actuated by a temperature-sensitive device, opens to drain all water from lines exposed to outside temperatures. The automatic 3-way solenoid valve permits the water to bypass the cooling tower under freezing conditions, or when it becomes too warm due to fan failure or overload in the storage tank. Under the latter conditions, the automatic overheat dump valve would also open. The subsequent drop of the water level in the storage tank causes the float valve to open and admit city water to make up the deficiency. Thus, in an emergency, city water would be used for cooling.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

To simplify planning, to save time, to get all the advantages of Jenkins specialized valve engineering experience, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

Complete description and enlarged diagram of this layout free on request. Includes additional detailed information. Simply ask for Piping Layout No. 71.

JENKINS VALVES
LOOK FOR THE DIAMOND MARK
SINCE 1864
TRADE JENKINS MARK
Jenkins Bros

Aerofuse Diffusers . .

. . . installed at the vital point of air delivery in the nation's first aluminum skyscraper . . . ALCOA BUILDING

TYPE D AEROFUSE DIFFUSERS AS INSTALLED IN ALCOA

In the heart of Pittsburgh's Golden Triangle, the gleaming Alcoa Building rises thirty floors, a dramatic new concept in multi-story building design and construction. In Alcoa, as in other outstanding buildings from coast to coast — where the efficient performance and attractive appearance of air distribution equipment must meet rigid engineering and architectural specifications — Aerofuse Diffusers were selected for installation at the *vital point of air delivery.*

TUTTLE & BAILEY inc

NEW BRITAIN, CONNECTICUT

keeping steam cheap . . .

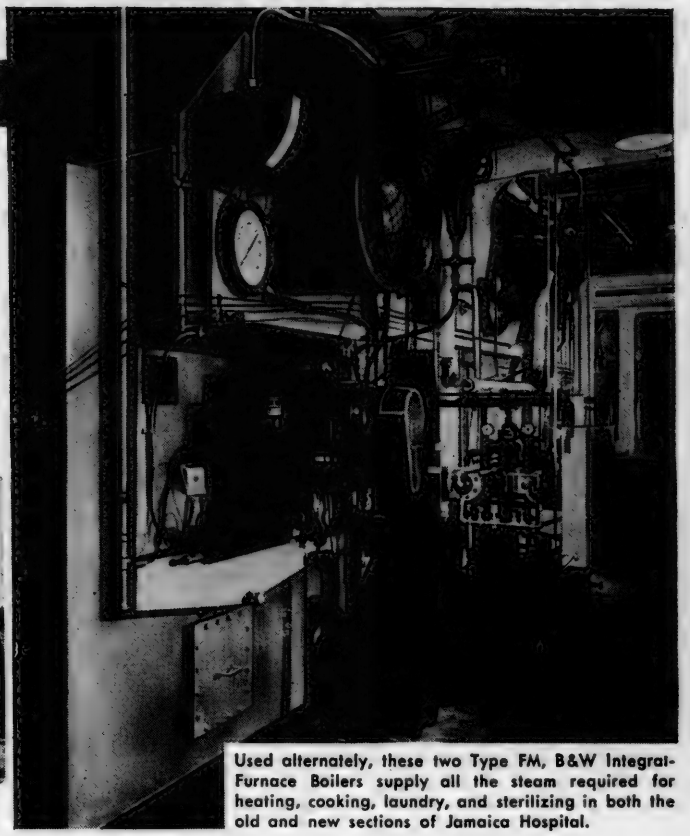
at

JAMAICA HOSPITAL

with

TWO B&W TYPE FM BOILERS

Otto J. Sambach, Consulting Engineer, Bessel and Matz, Architects.



Used alternately, these two Type FM, B&W Integral-Furnace Boilers supply all the steam required for heating, cooking, laundry, and sterilizing in both the old and new sections of Jamaica Hospital.

With the opening of its newly completed addition in 1952, Jamaica Hospital in Queens, N.Y.C., was expanded to a 270-bed institution with completely modern surgical and maternity facilities. Architecturally, the five-story and basement structure is a pleasant blend of old and new buildings having a total of 652 rooms for all purposes.

As with all hospitals, the choice of a fully reliable and efficient steam generator to supply the various services was vitally important. To meet the stringent hospital requirements, two B&W Integral-Furnace Boilers, Type FM — each of 10,000 lb per hr steam capacity — were placed in service in June 1952. These oil-fired units are under completely automatic control — operate with minimum supervision. Used alternately, each FM Boiler carries the full steam load throughout the hospital . . . supplies sufficient steam for all heating, hot water, kitchen, laundry, and sterilizing requirements. Additionally, they supply steam and hot water through underground lines to a nurses' residence and a separate residence for employees a city block away.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

After almost two years of experience with these compact, economical FM units, Chief Engineer V. Petersen, his Assistant Chief F. Zwiesler, and the operating crew report complete satisfaction with their performance. Along with other hospitals in various parts of the country, the new Jamaica Hospital has found the B&W Type FM Boiler ideally suited to its needs.

The already wide and steadily growing popularity of this shop-assembled B&W Boiler for a broad range of industrial, commercial, institutional, and other applications, is attested by the units now in service or on order, having a total steam capacity of over 7,000,000 lb per hr. The versatile FM is available in standard sizes for loads ranging between 2,900 and 28,000 lb of steam per hr at pressures to 235 psi.

Get the full story of this unusual small boiler. Write for Bulletin G-76A for a detailed, illustrated description of its cost-saving features. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York, 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-637

THRUSH QUALITY

pays dividends in time savings and customer satisfaction

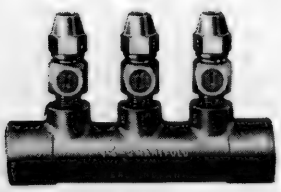
Balancing Valves *for Radiant Hot Water Heat*

GIVE ACCURATE CONTROL OF WATER FLOW, POSITIVE SHUT-OFF FOR AIR ELIMINATION

SAVE TIME and trouble in balancing radiant coils with these precision built Thrush Balancing Valves. Carefully made to give accurate control of flow. In eliminating air, the shut-off is positive. Flared fittings for 3/8" and 1/2" tubing. See your wholesaler or mail the coupon below today.

THRUSH MANIFOLDS

Thrush Manifolds save time, space and fittings. 1" and 1¼" sizes, each with two, three or four ⅜" or ½" threaded branch outlets.



Return Manifold with Balancing Valves

Supply Manifold

Mail Coupon Today !

H. A. **THRUSH** & COMPANY, Department D-5, Peru, Indiana

Please send us illustrated bulletin on Thrush Balancing Valves and Manifolds.

NAME _____ ADDRESS _____

CITY _____ STATE _____

perfecta CIRCULATORS

Distinguished for excellent design — a perfect shape

Already manufactured under license in France, Germany, England, Sweden, Italy and Spain.

THE GREAT SUCCESS IN EUROPE

The modern pump for central heating systems giving full satisfaction.

- ★ perfectly silent
- ★ no stuffing box
- ★ no greasing of pump or motor
- ★ no service
- ★ visual check of rotation

wanted

GENERAL AGENTS OR LICENSE TAKERS FOR THE USA AND CANADA

Apply for particulars to

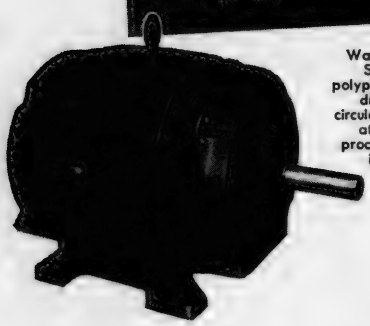
PUMPENBAU BRUGG K. Rütschi

Brugg (Switzerland)

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

You can *depend* on Wagner Motors to furnish *PLENTY OF POWER* for compressors, pumps or blowers

PUMPS



Wagner 15 hp Splash-proof polyphase motors driving water circulating pumps at a large oil processing plant in Louisiana.

BLOWERS

Wagner 40 hp Explosion-proof motor driving a blower to draw grain into a hopper at a Southern brewery.

Motors that drive compressors, pumps and blowers need plenty of electrical and mechanical stamina to hold up under the hard, steady grind demanded by these applications.

Selecting the right motor for such equipment is not a problem of procuring specially built motors, but of choosing a standard Wagner Motor suited to the job. Wagner Motors are diversified in design and can be readily adapted to a wide range of compressor, pump and blower applications.

Improve the performance of your equipment by choosing Wagner Motors to power your compressors, pumps and blowers.

Bulletin MU-185 gives information on the complete line. Let a skilled Wagner engineer discuss your motor needs with you. Just call the nearest of our 32 branch offices, or write us.

MAY IS NATIONAL WATER SYSTEMS MONTH

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6463 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

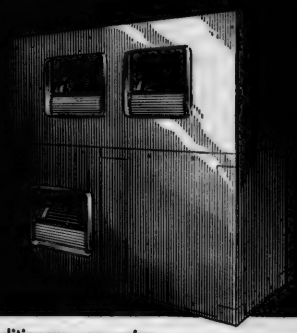
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

M54-6A

1 *of the many reasons why you will find it pays to sell Chrysler Airtemp*

Continuous and extensive advertising of ALL Chrysler Airtemp product lines **makes your selling job easier!**



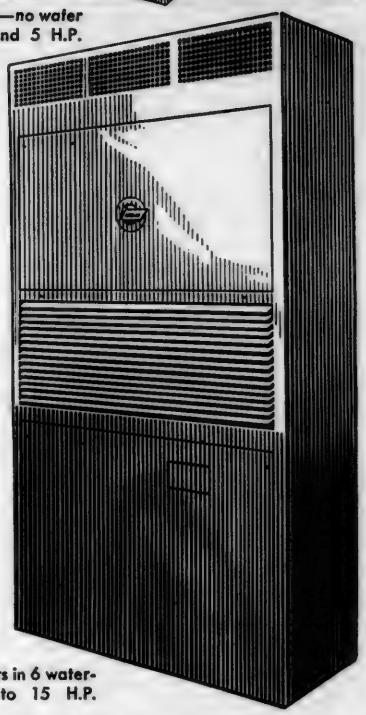
"Packaged" *Air-Cooled* Air Conditioners—*no water needed,* no plumbing required. 2, 3 and 5 H.P.

• The specific benefits of Chrysler Airtemp "Packaged" Air Conditioning to businesses and professions which constitute your best market are advertised consistently in 29 trade journals. In addition, extensive advertising on other Chrysler Airtemp products is constantly increasing acceptance of the Chrysler Airtemp name on *all* products which carry it.

For example, in this month of May alone, messages on Chrysler Airtemp Room Air Conditioners will appear in national magazines with a combined circulation of 11,720,345. Advertising on Chrysler Airtemp residential air conditioning will reach an additional 8,775,636 people in national magazines—also 300,000 builders, architects and contractors in leading building industry trade journals. Prominent news and business publications will carry the story of Chrysler Airtemp Air Conditioning for buildings to over 1,160,000 readers.

In this month, too, as every month, Chrysler Airtemp's popular full-color movie, "It's in the Air," will be shown to thousands of people throughout the country.

The tremendous impact of all this Chrysler Airtemp advertising is an important extra you sell with when you sell Chrysler Airtemp "Packaged" Air Conditioning. But only one of many! Check those additional extras described below. Then return convenient coupon for all of the detailed information you should have on the profitable Chrysler Airtemp Franchise.



"Packaged" Air Conditioners in 6 water-cooled models, from 2 to 15 H.P.

Guaranteed by Good Housekeeping — Replacement or Refund of Money if Not as Advertised Therein

7 *more advantages you sell with when you sell Chrysler Airtemp...*

★ **Consumer Confidence**—people know the Chrysler Airtemp name—associate it with engineering leadership—have confidence in the products which carry it.

★ **Lower Installation Cost**—super-quiet operation permits use within or very close to areas to be cooled, reducing amount of ductwork required. All units shipped completely factory-assembled and tested.

★ **Assured Dependability**—Chrysler Airtemp pioneered "Packaged" Air Conditioning in 1937, has more units in use today than anybody else. All units are manufactured to exacting standards of precision in a modern, windowless, completely air conditioned factory. Each unit thoroughly inspected and tested before shipment.

★ **Advanced Engineering** by Chrysler Airtemp offers your customers features that mean more because they do more for them.

★ **5-Year Compressor Warranty**—covers replacement of compressor, freight and labor.

★ **More Complete Line**—9 models meet all requirements.

★ **More Local Selling Helps**—the broadest line of tested and proved local selling helps for dealers.

CHRYSLER AIRTEMP

heating • air conditioning for homes, business, industry

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

H&V-5-54

Airtemp Division of Chrysler Corporation
P.O. Box 1037, Dayton 1, Ohio

I would like to know more about the Chrysler Airtemp Franchise.

Name_____

Address_____

City_____ Zone____ State_____

BARBER COLMAN

"UNI-FLO" ENGINEERED

Air Distribution

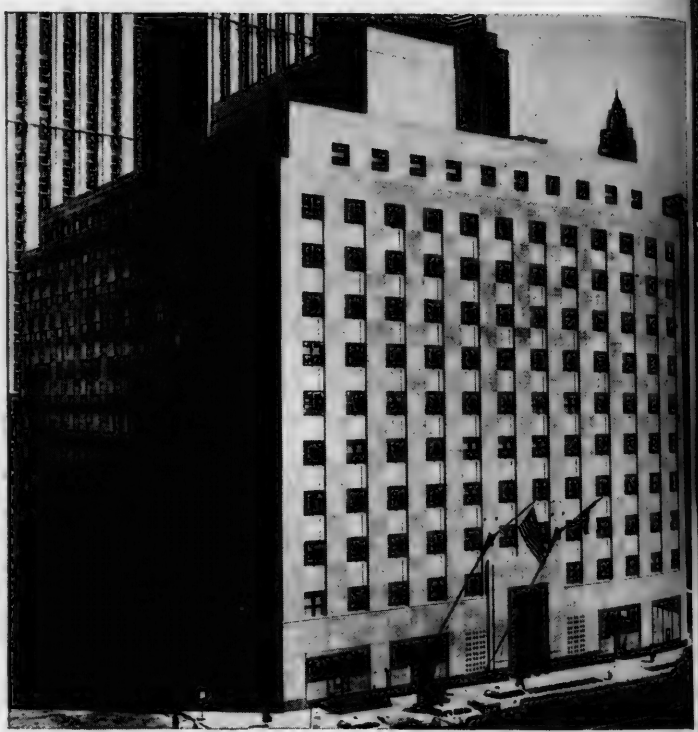
removable cores simplify installation of air diffusers in home office building of DUN & BRADSTREET, INC.

Noteworthy edifice in downtown New York City is this progressive, functional office building at 90 Church Street . . . home of Dun & Bradstreet, Inc. Several years in the planning stages, the resulting structure is complete with the most modern equipment for efficient operation.

Seven hundred and sixty-nine Uni-Flo Air Diffusers contribute to the comfort of occupants. Easily adjustable to set up air patterns conforming with the building design and needs of the workers, the Barber-Colman equipment brings fresh conditioned air to all offices with minimum noise and maximum efficiency.

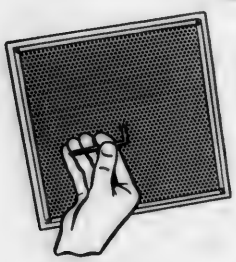
Removable cores in sidewall diffusers, plus simple mounting of ceiling diffusers, saved time and effort for the installing contractor. The usual plaster frames were omitted, yet there was no cracked plaster on the job to be patched and repainted.

As a protection for huge investments in air conditioning equipment, more and more owners, architects, engineers, and contractors are specifying the best in air distribution equipment to insure highest efficiency of the entire system. More and more are coming to Barber-Colman Company. Let us show you why.



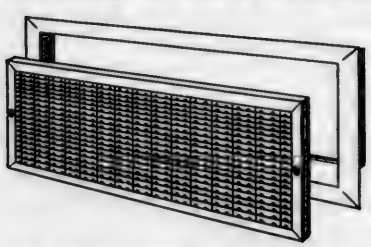
Home office building of Dun & Bradstreet, Inc., 90 Church Street, New York City. Uni-Flo air distribution equipment is installed in office areas from second through eleventh floors. *Architects:* Reinhard, Hofmeister and Walquist. *Consulting Engineers:* Syska & Hennessy, Inc. *Air Conditioning Contractor:* Kerby Saunders, Inc.

Square ceiling diffusers are *adjustable*



Unusually flexible to meet job conditions is this modern Uni-Flo Square Ceiling Diffuser which can be adjusted after installation to provide air deflection from vertical to horizontal and discharge air patterns in one to four directions. Attached to the standard T-bar construction of acoustical ceilings, it harmonizes perfectly with latest ceiling designs. Get Bulletin F-4728-1.

Removable cores also facilitate cleaning of ducts and grilles



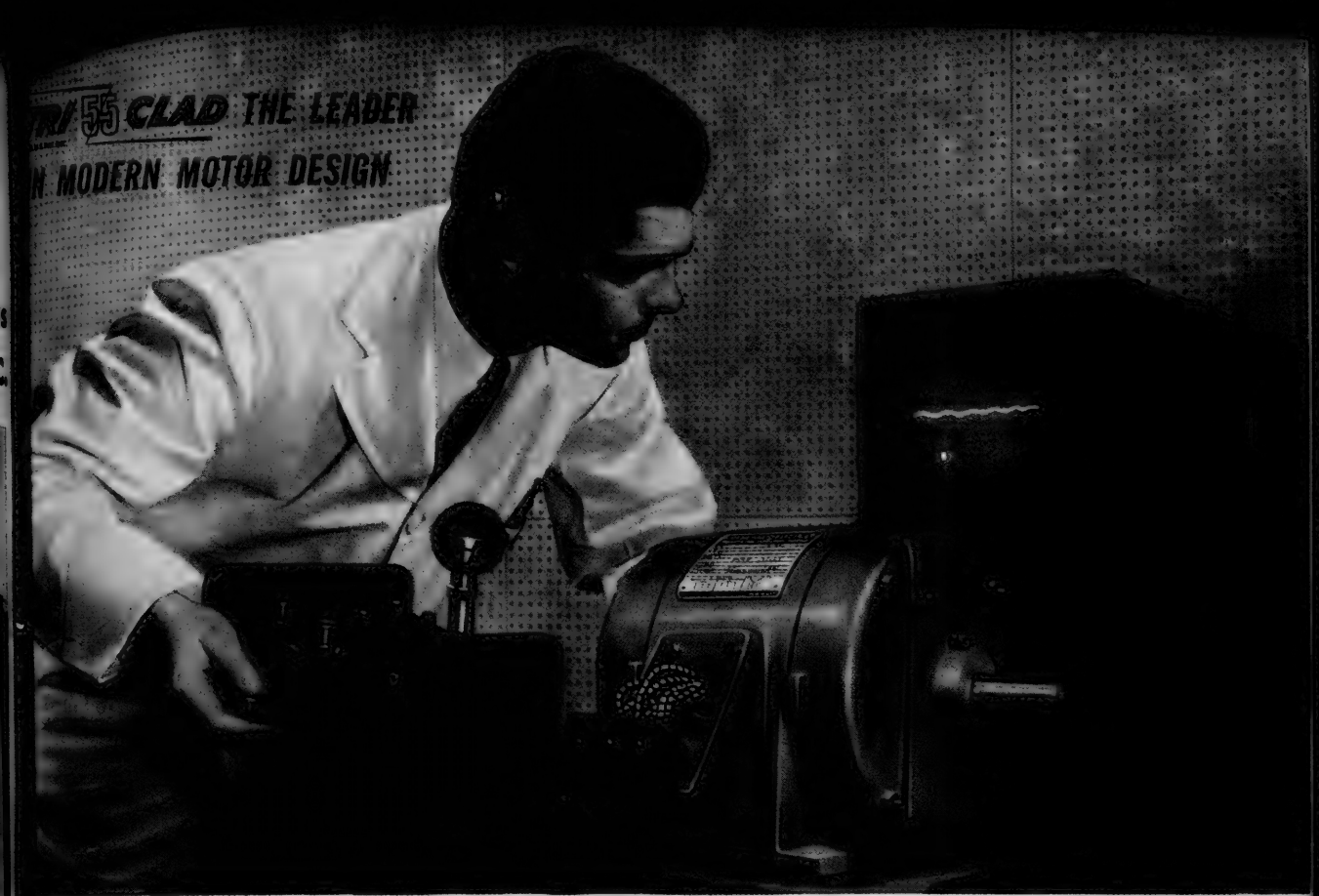
Plaster and wall decorations are safe from damage when installing, adjusting, or cleaning Uni-Flo Sidewall Diffusers. Complete core slips in or out with ease—frame has continuous sponge rubber gasket to minimize leakage. 1" lap on frame covers opening irregularities. Get Bulletin F-1415-10.

Uni-Flo Sidewall Diffusers in soffit provide a draft-free, comfortable atmosphere for office workers. Soundly engineered system is easily balanced, quiet and efficient in operation.

Uni-Flo Square Ceiling Return Grilles mounted in between fluorescent lights, blend gracefully with ceiling.

BARBER-COLMAN COMPANY, DEPT. F, 1102 ROCK ST., ROCKFORD, ILLINOIS

Air Distribution Products • Automatic Controls • Industrial Instruments • Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery



Sound-room tests prove TRI 55 CLAD motors operate at greatly reduced noise level!

REG. U.S. PAT. OFF.

Here's the new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact G-E Tri/Clad '55' motor, in ratings from 1 to 30 hp a-c.

To reduce noise, G. E. engineers developed a new concept —a sonant motor—a motor that sounds pleasing to the ear. They studied, and then reduced, the causes of motor noise—bearing rattle, magnetic hum, and windage. Sound room tests prove the Tri/Clad '55' is sonant, runs quieter.

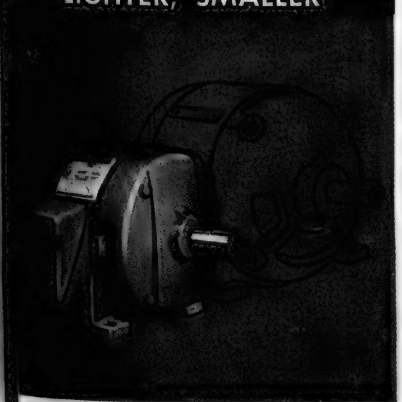
In addition, the modern looking Tri/Clad '55' motor is lighter and smaller—saves weight, saves space.

Try this new motor. See for yourself how the Tri/Clad '55' can help reduce noise and save space in your own equipment. Contact your G-E Apparatus Sales Office or G-E Motor Supplier today. For bulletins, write General Electric Co., Section 648-12, Schenectady 5, New York.

Progress is our most important product

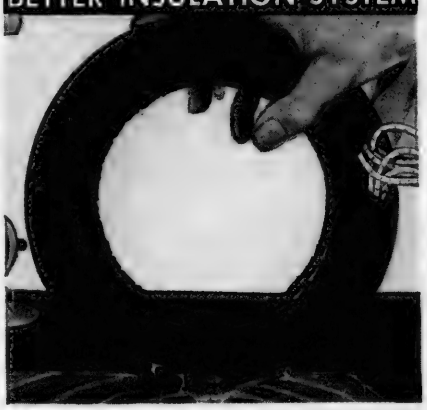
GENERAL ELECTRIC

LIGHTER, SMALLER



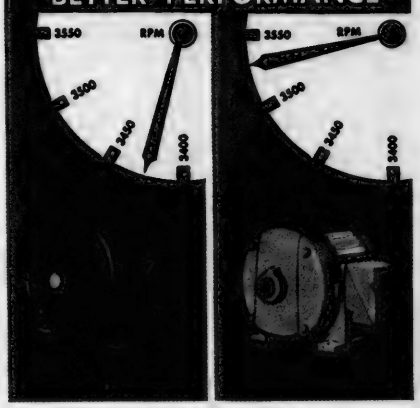
MORE COMPACT MOTOR means more horsepower per pound—saves space, weight—is easier to handle.

BETTER INSULATION SYSTEM



SILICONE RESIN COATING on stator plus stronger polyester-film slot and phase insulation increase electrical life.

BETTER PERFORMANCE



HIGHER FULL LOAD SPEEDS is typical of many performance improvements in the new Tri/Clad '55' motor.

For fast, sure welding

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

●This man is position-welding an expansion joint in a steam line. Only good steel pipe like Youngstown takes this type of weld easily. That's because top-grade steel bonds better and faster. Depend on Youngstown and you're hours of labor ahead.

Youngstown

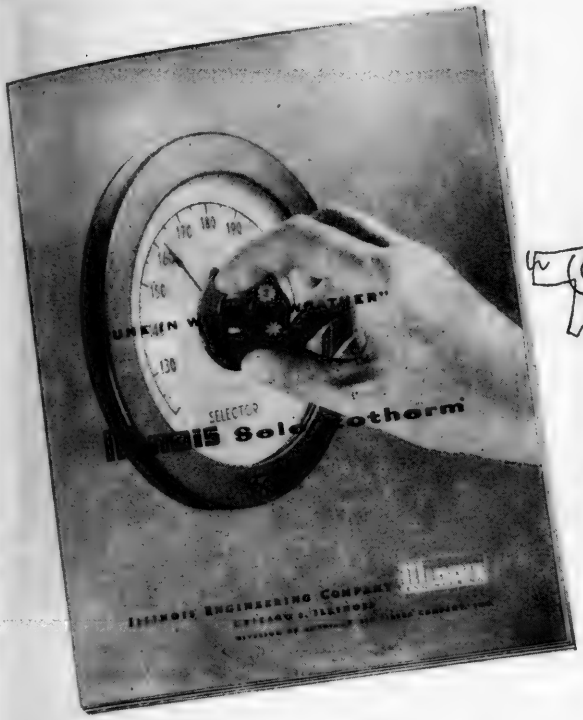
QUALITY Y YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

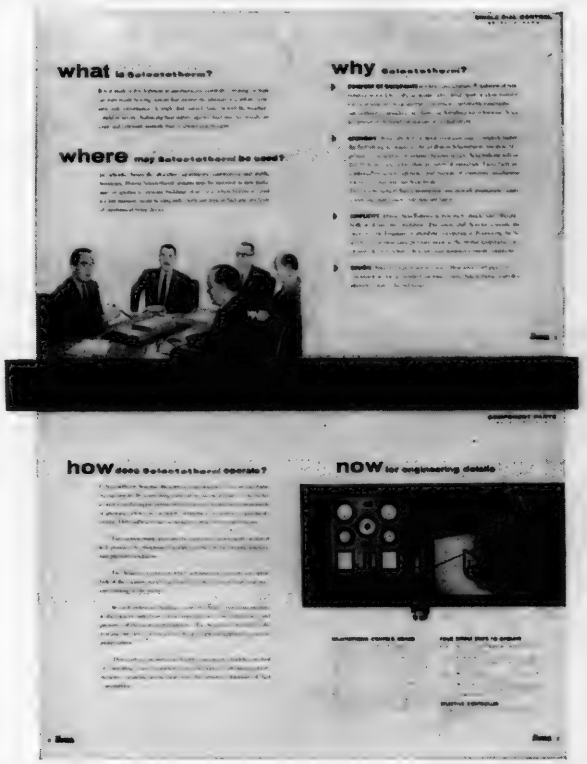
Manufacturers of Carbon, Alloy and Yoloy Steels

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES



investigate this modern development in automatically controlled heating!



Send for your copy of this new 16 page bulletin—an interesting and easy to read description of Selectotherm advantages with engineering data.

To the architect and engineer an Illinois Selectotherm System with single dial control means lasting client satisfaction—to the heating contractor, simplicity and ease of installation—to the owner a sound investment that will pay big dividends in comfort, convenience and fuel economy.

illinois ENGINEERING

ILLINOIS ENGINEERING COMPANY

2035 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

Send today for your copy of the new Selectotherm bulletin that gives interesting engineering data.

Illinois Engineering Company
2045 South Racine Avenue, Chicago 8, Illinois

Send at once____copies of Illinois Selectotherm Bulletin 540 on Controlled Heating.

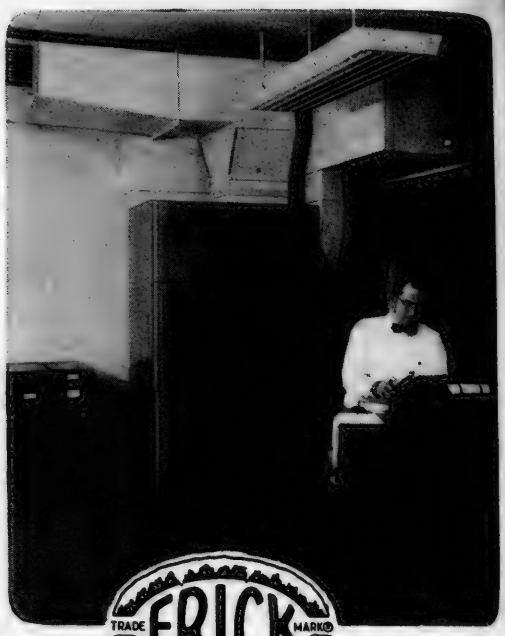
Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

At right: One of Four Frick Unit Conditioners Serving the Bankers Trust Company at Indianapolis.



This Shoe Store Rings-up More Sales Since the 5-hp. Frick Unit Air Conditioner and Duct System Shown were Installed.

3-hp. Unit Supplying Conditioned Air to the Sales Room and Offices of a Dairy Bar in Mississippi.

Air Conditioning Will Help Any Business (Yours Included) Add-up More Profits—

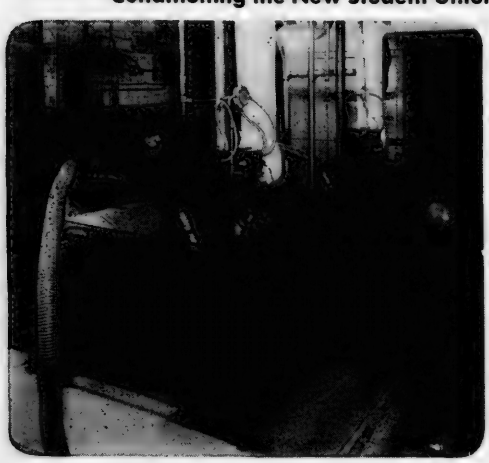
By drawing more trade, getting customers to stay longer, and keeping your staff more alert, more loyal.

Whether you are a distributor or a user, Frick air conditioning will meet your requirements completely. We build packaged units in three sizes, and central systems of many types. Frick engineers are unbiased in recommending the exact equipment you need.

Get in touch with the nearest Frick man today. Branch Offices in principal cities: good territories for dealers still available.

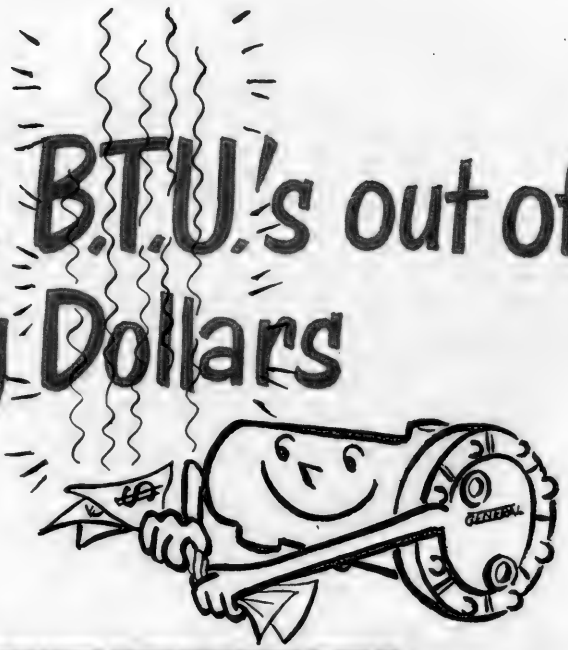
FRICK CO. — DEPENDABLE REFRIGERATION SINCE 1882 — WAYNESBORO, PENNA. U.S.A.

Below: Two 6-cyl. Frick "ECLIPSE" Compressors and Auxiliary Equipment Provide 120 tons of Refrigeration for Air Conditioning the New Student Union Building at Kansas State Teachers College, Pittsburg, Kansas.



This specialized line

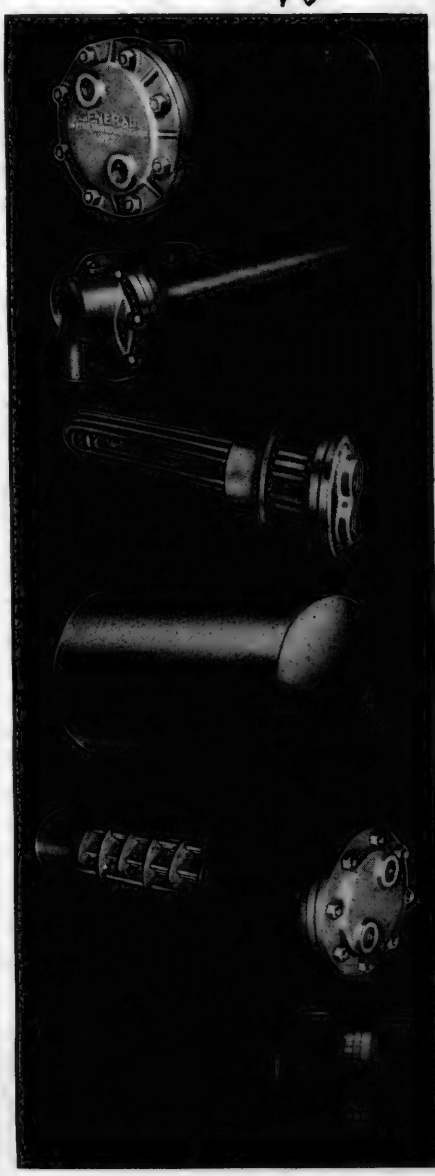
Squeezes more B.T.U.'s out of Fluid-heating Dollars



Whether the heat source for your next installation is hot water, exhaust steam, or live steam, you'll find a GENERAL Industrial Fluid Heater specifically designed to get the most heat out of it.

Every GENERAL heater is backed by 25 years experience in the manufacture of industrial fluid-heating equipment. It's the end-product of constant modification and improvement . . . "tops" for its particular application.

No matter what job you're planning — new construction, expansion, modernization — this up-to-date line is your best bet . . . for better performance, longer service, lower cost. Write for Catalog 60. General Fittings Company, Dept. L, 123 Georgia Ave., Providence 5, R. I.



INSTANTANEOUS WATER HEATERS No tank required. 23 sizes; capacities to 300 g.p.m.; uses live or exhaust steam.

CONVERTERS 74 sizes for economical heat transfer. Flow capacities up to 900 g.p.m.

TANK HEATING UNITS 20 sizes for all requirements.

STORAGE TANKS 10 sizes; capacities to 315 gals.

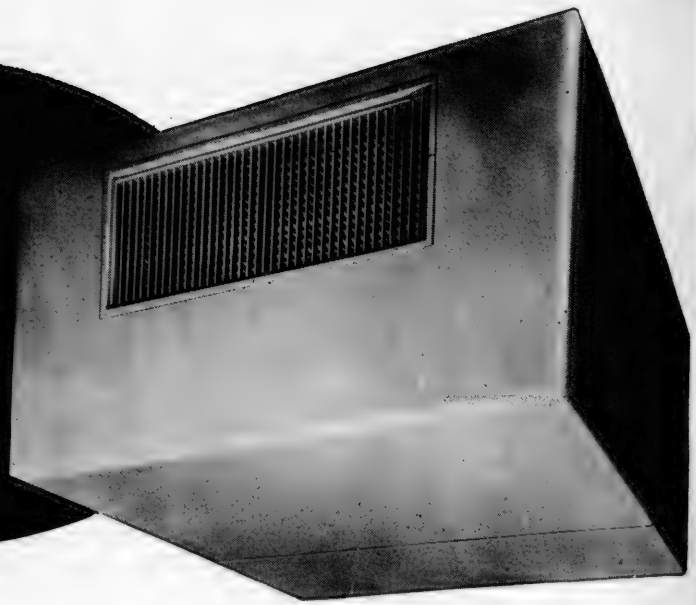
FUEL OIL HEATERS 17 sizes; capacities to 375 g.p.h. at 2 lbs. pressure.

INDIRECT HEATERS 15 sizes for use with large-size storage tanks.

GENERAL FITTINGS COMPANY

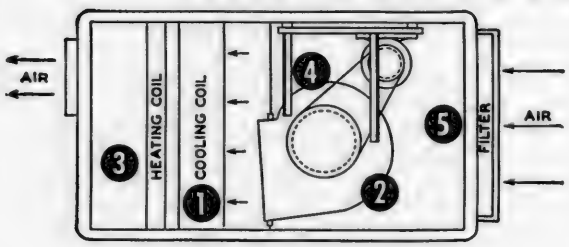
TANKLESS AND INDIRECT WATER HEATERS AND HEATING SPECIALTIES

NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



(1) MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

(2) "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

(3) ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

(4) QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

(5) FOR FINISHED INTERIORS

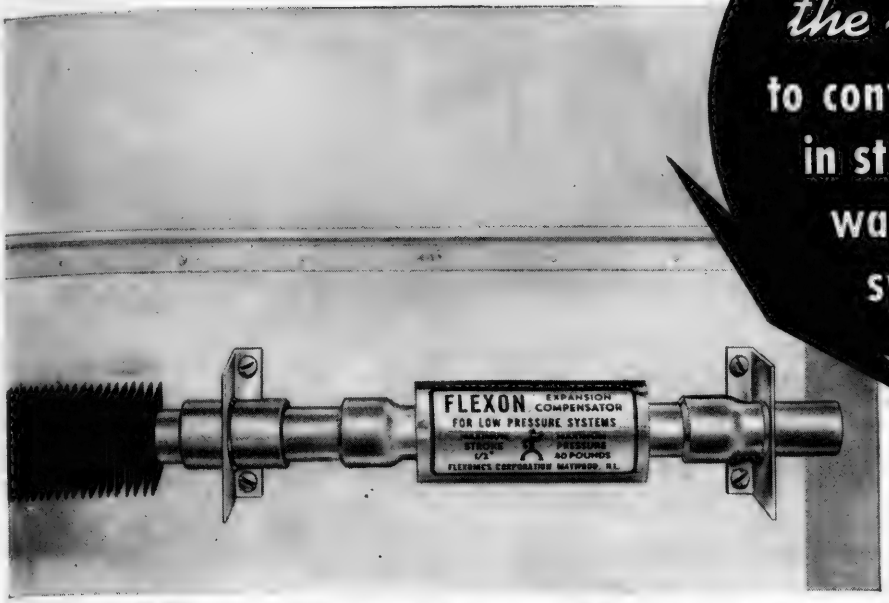
Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

MANY OTHER OUTSTANDING FEATURES

WRITE FOR BULLETIN AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

Here's the right way to control expansion in steam and hot water heating systems...



THE *New* FLEXON EXPANSION COMPENSATOR...

DESIGN DETAILS

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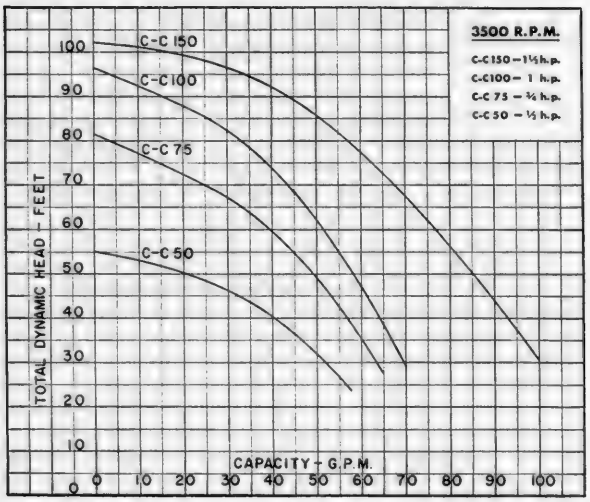
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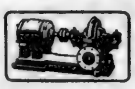

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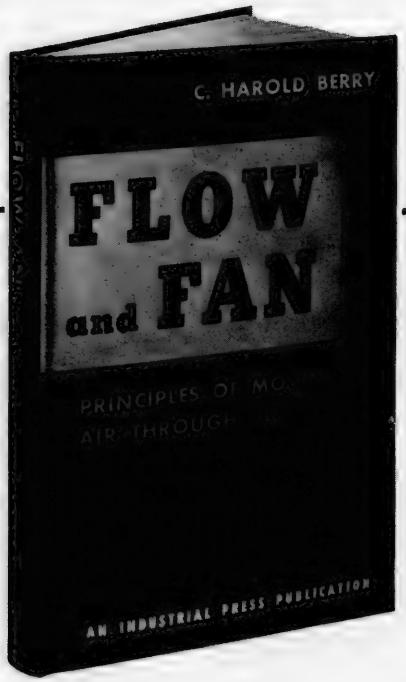

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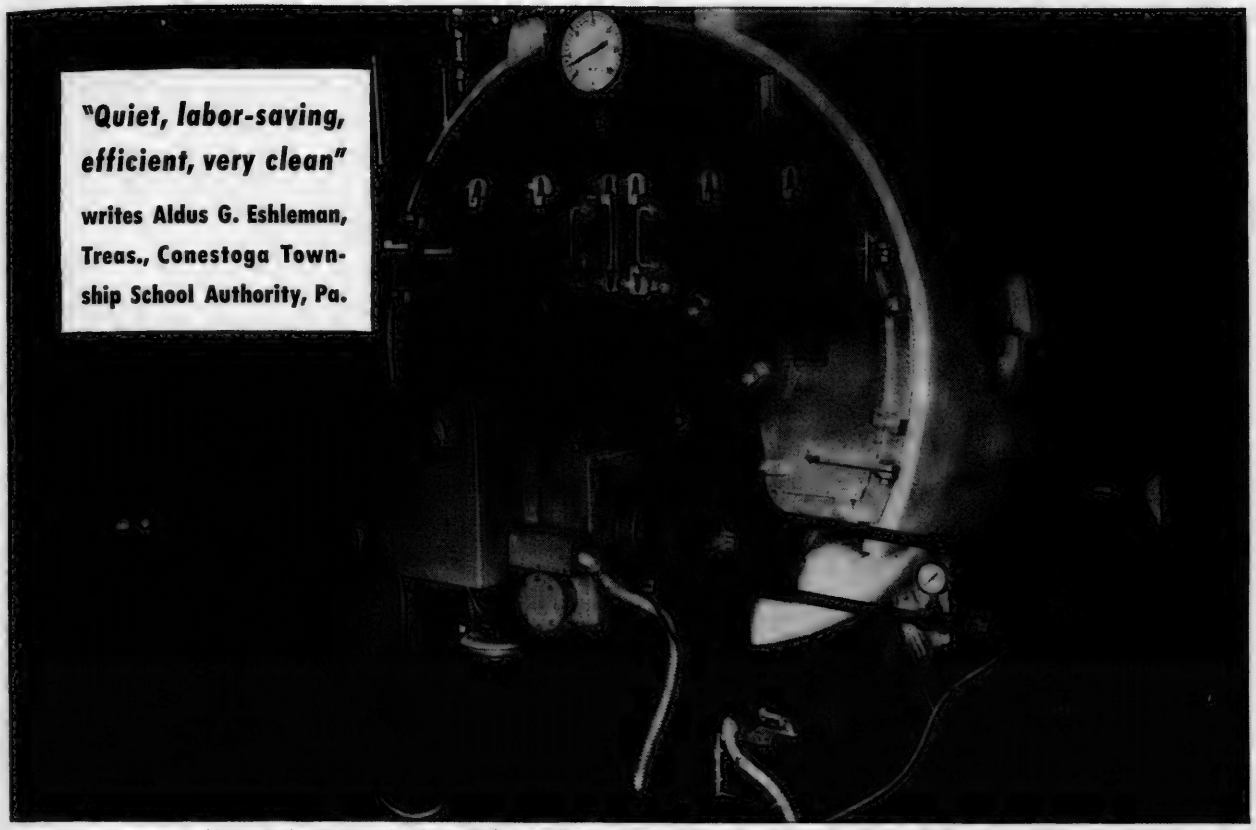
It's quiet says Pennsylvania school official



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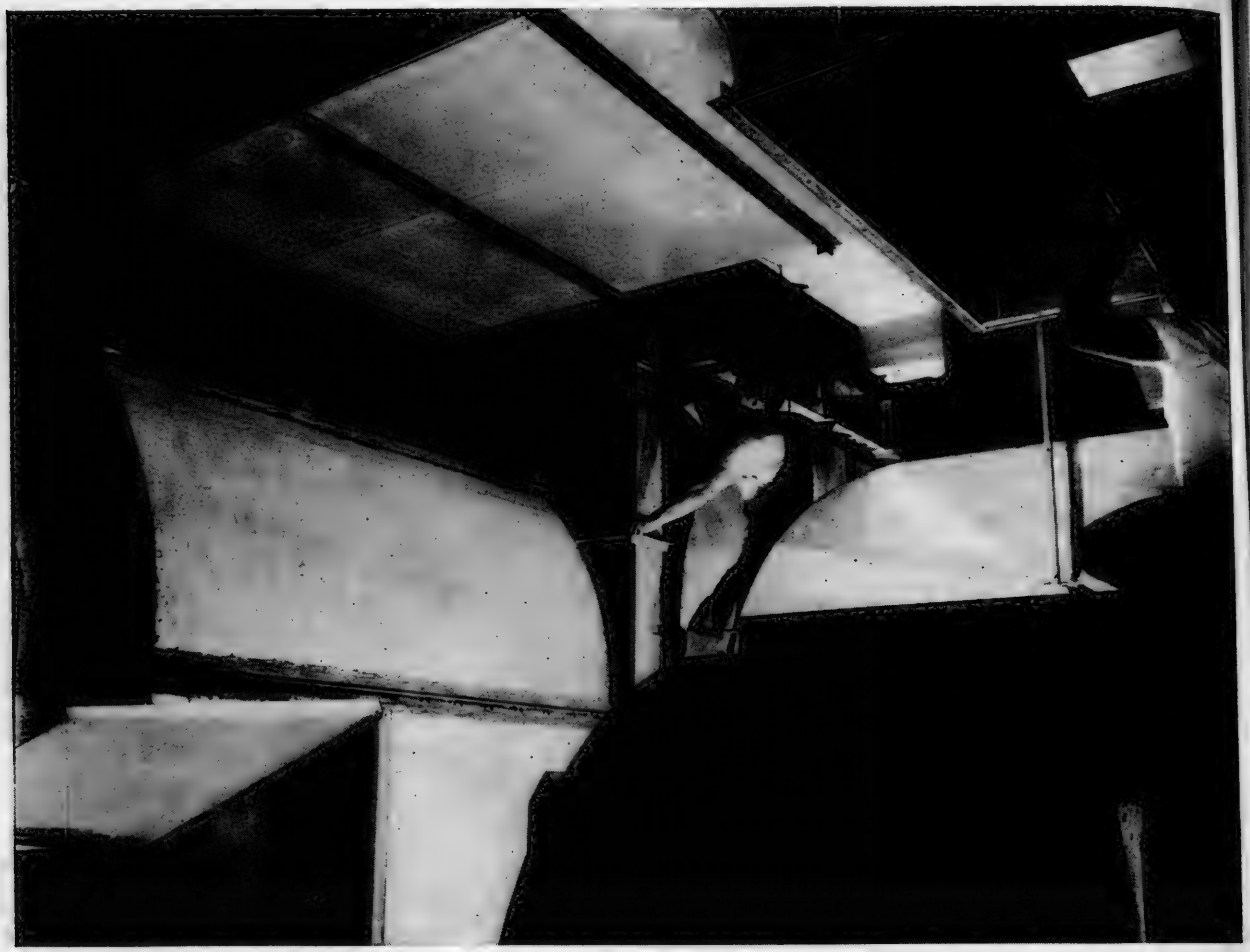

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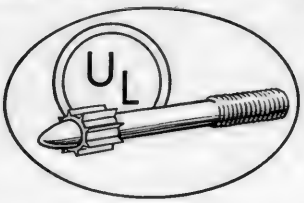

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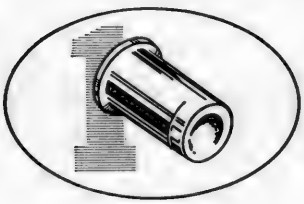

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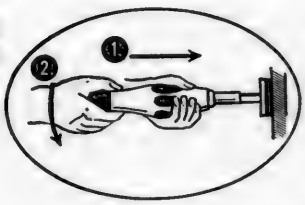

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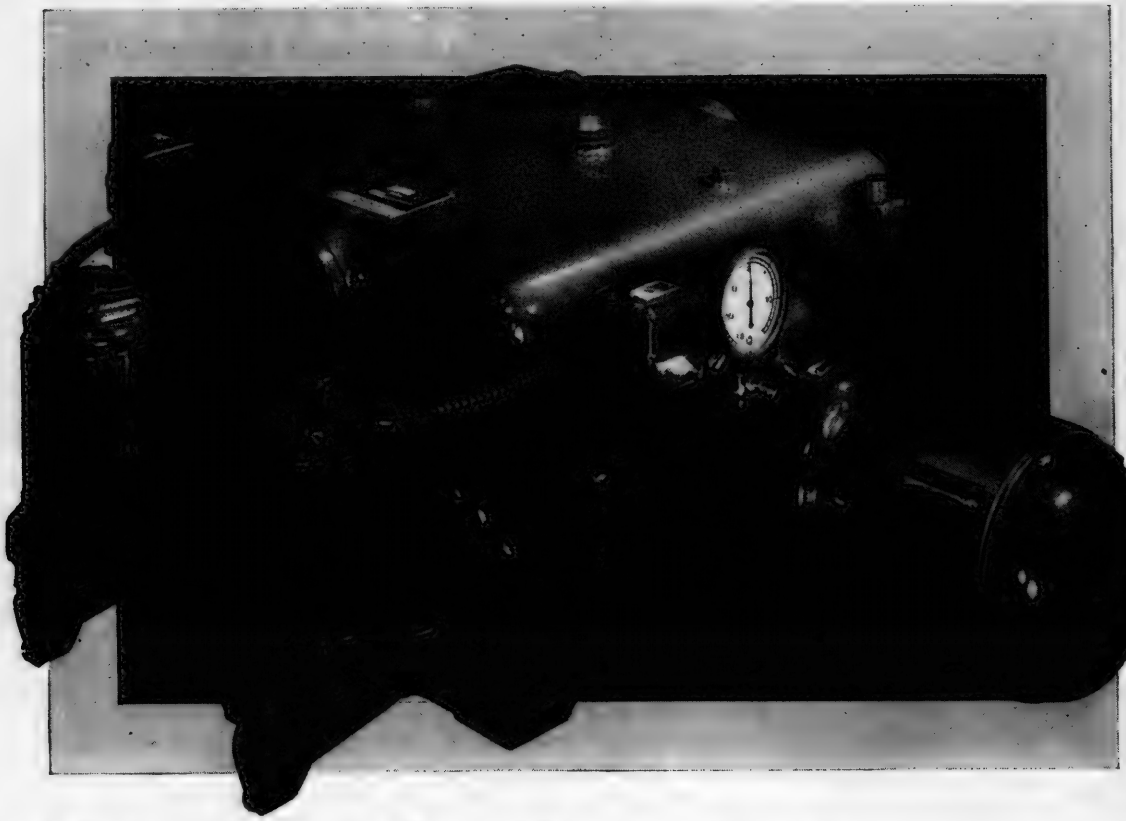

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These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

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Industrial Plant Served by 10,500-ton Air Conditioning System

WARREN G. MOSES

Partner, de Laureal & Moses, Consulting Engineers, New Orleans, La.

An industrial plant built for use during World War II has been air conditioned and again placed in operation. The design is particularly noteworthy because all components of the old 8,062 tons air conditioning system were removed and sold.

A 10,500-ton industrial air conditioning system costing $3,736,000 and used to control temperature and humidity in a 43-acre New Orleans industrial plant, is believed to be the largest such installation ever made in an existing structure. A previous smaller installation had been partially removed and this created additional design problems as the incorporation of the remaining elements of the original project, an economic necessity, required intensive analysis of the original system and imposed severe restrictions upon the new design. The installation was designed to aid in the prevention of rust and in the reduction of dirt and dust in the air by controlling the atmosphere within the enclosed area of the plant. This conforms with modern practice for plants of this nature and is becoming a standard engineering requirement wherever fine machine work is being done. Complete manufacturing processes are installed from the initial rough casting stage to the production test run of the finished product.

In the New Orleans area high humidities occur frequently and dehumidification of the plant atmosphere is important to remove the moisture loads created by the human element, latent heat from process work and moisture from outside air introduced. One method of controlling rusting is the prevention of condensation on metal parts. Dew point control of the plant atmosphere accomplishes this with the considerable by-product of creating excellent working conditions for employees.

History of Original Project

The structure was built in 1942 as an aircraft manufacturing plant. Including its mezzanine, the Main Plant contains 1,872,000 sq ft of floor space under a single roof. It is approximately 1,680 ft long by 1,095 ft wide and the roof is 54.5 ft above the finished floor. In addition to the Main Plant, there is a two-story Engineering Building, 1,157 ft long by 50 ft wide, and a two-story Office Building, 837 ft long by 50 ft wide. A separate boiler plant, 270 ft from the main plant, provides chilled water, steam and compressed air services over an interconnecting trestle. The grounds cover over 1,000 acres.

Equipment Sold

At the conclusion of World War II, when the plant closed, everything salvageable was removed and sold, including all major components of the 8,062-ton air conditioning system of humidity and temperature control

Warren G. Moses, following graduation from Tulane University in 1938 with a B. E. in Mechanical Engineering, was employed by an engineering and contracting firm in the design and installation of air conditioning, refrigeration, heating and ventilating systems. During World War II he was Captain in the Army Air Force and had considerable combat duty over Japan as a flight engineer on a B-29. He took part in the initial bombing raid on Japan and flew 30 missions. After the war he returned to his former employer as assistant manager of the air conditioning division. In 1947 he formed a partnership with David de Laureal for the practice of engineering and that firm now has offices in New Orleans, La., Mobile, Ala., and Pensacola, Fla. He is a licensed professional engineer in the states of Louisiana, Alabama and Florida.

which operated at partial capacity for one season only.

The plant is virtually windowless as fixed sash located high on all sides permit no natural ventilation, and any manufacturing operation other than that for full sized aircraft, require that the hanger type doors on the west side be kept closed.

Air distribution was accomplished by 42 apparatus rooms on the roof, each containing a blower, air washer, eliminators, heating coil, control dampers and automatic controls. Air quantities for each apparatus room varied from 59,800 to 74,200 cfm, with refrigeration capacities varying from 190 to 229 tons. Each blower discharged into a duct system located in the roof truss area.

Selection of System

Simultaneously with the calculations of the present actual load for the system, a study was undertaken to determine the most practical of the following courses of action:

(1) The feasibility of installing a completely new system, or (2) using part of what was left of the original system plus new equipment, or (3) utilizing entirely what remained of the original. Many factors were weighed with initial cost and installation time of paramount importance.

It became apparent very early in the investigation that the remaining existing equipment could not be used in toto, nor could the original installation be repeated. Not only did the 20% increase in tonnage require more capacity for all items with the size of the chilled water supply main already fixed, but the underground return main was blocked by new construction. The cooling tower basin was unusable in part. More decisive was the fact that the present distribution of heat loads in the main plant indicated that a majority of the roof coil chambers were undersized for the new load requirements.

The solution was to make the most of what parts remained of the original system and supplement it wherever required. Existing duct work, roof coil chambers, piping systems and boiler room equipment represented an installation valued at $1,600,000. Some repairs were needed to place it in operating condition.

Table 1 gives a comparison of the loads, for the original system and for the present system. In addition, a 600-ton comfort cooling system was required for the Office and Engineering Building to make the combined installation one of 10,500 tons capacity.

To calculate the new heat load an extensive survey was undertaken as the plant contains several thousand motors; four major heat treatment areas; 46 different exhaust systems; a plant-wide steam grid distribution piping for process work; a bus-duct grid for electrical distribution; and several new transformer sub-stations. A problem was the existence of several sizeable furnace and heat treatment areas within the plant proper. The effect of omitting partition walls was carefully considered, but calculations indicated that walling off of these areas of extremely high heat concentration was imperative from both an initial and operating cost standpoint.

TABLE 1—LOAD REQUIREMENTS FOR ORIGINAL AND PRESENT SYSTEMS

Item	Original System		Present System	
	Quantity	Tons Refrig.	Quantity	Tons Refrig.
People, Number	12,860	878	3,458	260
Lights, kw	5,870	1,660	1,997 kw	605
Motors and Appliance	Unknown	902	26,900 hp	2,750
Steam Apparatus and Piping	Unknown	.....	20,700 ft	660
Transmission & Solar	.....	1,854	.....	2,000
Miscellaneous Equip.	Unknown	.....	.....	300
Pumping Losses and Leakage	Unknown	.....	.....	300
Total Air, cfm	2,986,500	.....	3,726,500	.....
Outside Air, cfm	678,000	2,780	730,000	3,025
Tot. for Main Plant—Tons Refrig.		8,062		9,900

Furnace Operations

The major areas of the plant that contained furnace operations seriously affecting the size of the air conditioning system consisted of the following:

Muff Casting area, 298 ft x 73 ft, which included 12 batteries of muff casting ovens.

Mahon ovens, 106 x 30 ft, containing four very large ovens.

Nitriding area, 254 x 80 ft, which contained 26 nitrading furnaces, two crankshaft heat treating furnaces and several other auxiliaries.

Heat treat area, 350 x 160 ft, where a variety of different operations occurred, involving several hundred furnaces and various heat treatment procedures.

At the request of the operators a study was undertaken to obtain a comparison of the cost of conditioning these areas without isolating walls versus the cost of walling them in but providing ventilation and exhaust, thereby affecting a reduction in the size of the air conditioning system. Calculations indicated an additional capacity of 5,500 tons would be needed for a system adequate to handle this additional load at an added cost of over $1,500,000. As it was not felt that air conditioning would adequately satisfy comfort needs in these areas, curtain walls around the four areas are thus incorporated in the project.

A major difference between the present and original requirements is that temperature and humidity control was required near the floor only, and for all practical purposes the building could have been 12 ft high. Process piping and an electrical distribution grid had been attached to a system of grillage suspended from the roof

One of several ventilation and exhaust systems installed on the roof of the plant.

trusses and the columns at the 12 ft level throughout the plant. Consequently, allowance for the "unconditioned" space between the 12 foot level and the 54 foot roof was estimated and utilized. The design incorporated means of stratifying conditioned air at the lower level as effectively as possible.

Adaptation of Existing Equipment

For the adaptation of the existing facilities and to obtain maximum usage in the new installation, several major problems had to be solved. The inflexible design problem imposed by the existing material and the research into the past data complicated the development of the new design.

The main problems on design were:

(1) More capacity from the existing chilled water distribution system and the existing coil chambers.

(2) More tonnage (20 per cent) and more air circulation throughout the main plant.

(3) New ways of returning chilled water from the main building to the Boiler House, since new construction had blocked off the original gravity passage.

(4) Increase in chilled water generator capacity in the boiler house, from the original design around 8,062 tons to 9,900 tons.

(5) Best use of the available cooling tower basin, as one-third of the area had been put to other purposes.

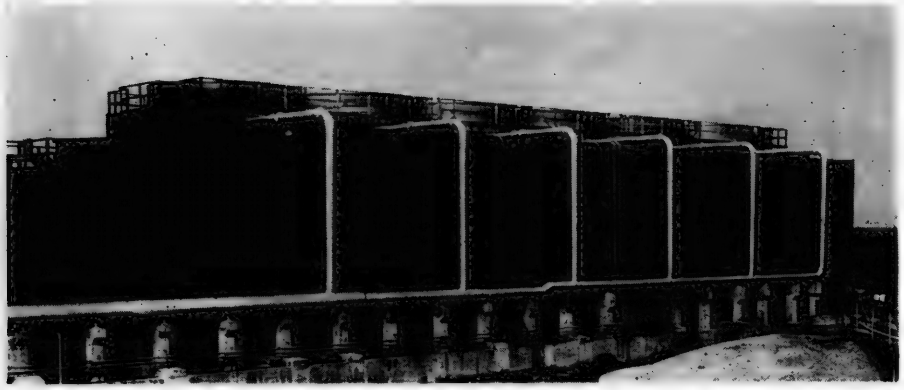
The existing chilled water supply distribution system extended intact from the boiler house, along a trestle to the main plant and throughout the plant to each roof apparatus room. Since the pipe was not new and was not in use for some time, the computed maximum flow of water could now be only 17,120 gpm, which would be 1,653 gpm less than the original quantity. To compensate for this a lower supply water temperature was decided upon. This was established at 47F with return water temperature of 60.9F. This may be compared to the original system's 51F supply and 61F return.

To best utilize the lower chilled water temperature, a study was made of each apparatus room and coil chamber design. Here again it was found that the designers had used maximum figures in every way and no further capacity could be obtained from the spray washer units without alteration. The original design was based upon use of an air washer with the chilled water sprayed into the air stream and returned by gravity to the chilled water generator. With a reduced quantity of water available at a lower temperature, a 25 hp recirculating pump with an automatic control is added to each roof coil chamber unit. Sprays have metal nozzles and the direction of one bank is reversed to permit both banks to operate counter to air flow. These measures improved the rated efficiency so that only 16,200 gpm of the total available 17,120 gpm is required for the roof apparatus rooms, leaving 980 gpm of 47F water for other usage.

The existing air distribution system was analyzed as it was in good condition. It was readily determined that here again no leeway existed that would permit increased air quantities, so they remained of necessity substantially as originally installed. A considerable credit was taken in the load calculation for stratification effect (as conditions would now be critical only below the 12 ft level) so the entire existing air distribution system was altered to obtain the utmost effect. This alteration includes the hanging of round prefabricated aluminum collars from 332 supply air outlets and 29 return air outlets. Several major new duct runs handle areas of high heat loads. The supply air drops are equipped with several different types of air distributors, depending upon the direction required for the supply air quantities. Where duct runs pass through non-conditioned areas (formed by the walled-off heat treatment areas) insulation is added to both supply and return air ducts. It was found that a very large portion of the plant with high heat loads now required more capacity than the roof apparatus rooms and their connecting duct systems provided. To handle these areas, the unused excess amount of 980 gpm chilled water at 47F is utilized through "sensible cooling units" and additional cooling is picked up by doing further work on 1,080 gpm of 59F return water obtained from some of the roof apparatus room air washers.

As all outside air and all latent cooling can be handled by the roof apparatus rooms, plus a substantial portion of the internal sensible load, the only needed addition is equipment to do sensible cooling. To perform this task, standard air conditioning units containing fans, chilled water coils, filters and eliminators, were selected. Called sensible cooling units, they are used in two groups: Units utilizing the excess amount of 47F supply water are termed Supply Sensible Coolers; those utilizing the return water at 59F from the roof apparatus rooms are designated return sensible coolers.

These units are suspended on platforms in pairs over the grillage at about a 14 ft level. They discharge air through short directional vanes. The units and coils were selected to work with relatively high water temperature and high face velocities. Numerous local points with high latent loads exist in the plant (and furture relocations of equipment could easily provide more) so there is no



Cooling tower for the 9,900 central portion of the system. On the left is one of the three smaller cooling towers which occupy a portion of the foundation.

positive assurance that dry coil conditions will always exist. For this reason condensate drains and eliminators are added to the units. To obtain the design water temperatures, the systems of supply and return sensible coolers are kept independent.

The supply sensible coolers are connected to a separate piping system utilizing water taken from the main chilled water supply at 47F and mixed with the system's own return water to increase the quantity and maintain a 55.5F water temperature. This is all pumped from a point within the main plant to each supply sensible cooler. Return from this system is taken independently outside the main plant to the new chilled water sump. The return sensible coolers are each supplied by independent re-circulating pumps, taking 59F water from the leaving side of some roof apparatus rooms.

A new chilled water sump is located between the main plant and the new building and the new chilled water pumps are located there. Discharge from the chilled water pumps is taken overhead along the wall of the main plant to the trestle, to the boiler house, through the chilled water generators and then it connects to the exising chilled water supply main for recirculation to the main plant.

The original installation had seven 1,150-ton steam turbine driven centrifugal compressors, with space allocated for an eighth. Exhaustive studies of the spaces available and the locations of condensers, piping and accessories indicated that an eight-machine arrangement would still be the most desirable. To obtain equipment as standardized as possible seven 1,100-ton machines and one duplex 2,200-ton machine are installed.

Two of the original four boilers remained and were renovated. Two additional new boilers are now added, selected to conform as closely as possible to the existing foundation. The operating pressure is 225 psi so the four can be paralleled. The entire plant is equipped with alternate choice of steam or electric drive for each accessory.

The original cooling tower was a forced draft installation, 224 ft long by 85 ft wide and had twenty-four 25 hp fans. As approximately 72 ft of the basin had been used as a foundation by three previously installed cooling towers, the new tower was designed to utilize the available area of the same basin, and is only 150.5 ft in length. A tower 64 ft wide and 42 ft high was selected with six 75 hp induced draft fans, capable of cooling 30,000 gpm from 107F DB to 85F DB at 80F WB ambient. A change in area drainage required for hurricane protection obviated the previous method of obtaining makeup water from bayous (which would have required extensive chemical water treatment) so a 700 gpm deep well provides for cooling tower makeup.

For summer cooling and dehumidification, the maximum outside air damper and the recirculating chilled water pump are interlocked to be operative only when the fan is used. Control is obtained primarily from returned air at each unit, automatically providing zone control. A wet-bulb recording controller with its sensing element in the return air stream measures the wet bulb and simultaneously resets the control point of a sub-master indicating controller having its sensing element in the air stream leaving the chilled water sprays. As the return air wet bulb will vary from 65F to 68F, the control point of the sub-master will automatically reset from 60F to 55F.

The sub-master controller measures the dew point temperature of the air leaving the sprays and varies the chilled water valve setting, proportioning the amounts of chilled and recirculated water to maintain the desired dewpoint. Whenever the chilled water valve becomes fully closed, the recirculating water pump stops. This control will operate whenever the outside air dry bulb exceeds 59F. Under its control the maximum outside air damper closes and the return air damper will open wide. When outside air dry bulb is below 59F, the chilled water valve closes and the dew point controller positions the maximum outside air damper and the return air damper to maintain a 50F air temperature entering the reheat coil.

To prevent the temperature of the air entering the sprays from falling below 36F, a low limit thermostat is arranged to gradually close the maximum outside air damper.

A recording controller of the dry bulb type, with the sensing element located in the return air stream, is arranged to sequentially control the reheat valve, the floor bypass damper, and the reheat bypass damper. Under the maximum heating demand, the reheat valve will open wide, the floor bypass damper closes, and the reheat bypass damper closes. On a rise in dry bulb temperature the reheat valve gradually closes, the floor bypass damper gradually opens, and the reheat bypass damper gradually opens. On a further rise, the reheat valve remains fully closed, the reheat bypass damper remains wide open, but the floor bypass damper gradually closes. On a drop in temperature, the sequences reverse.

Each of the 21 pair of supply sensible cooling units has control systems arranged to be identical in operation.

An indicating dry bulb controller located near the floor is set to control the three-way modulating chilled water valve admitting chilled water to the coils or bypassing them. When the unit fans are inoperative the valve goes to the full bypass position. A constant chilled water temperature of 55.5F will automatically be maintained by an indicating controller, which mixes return water with 47F supply water from the main chilled water supply.

Each of the 20 pair of return sensible cooling units has identical control systems. Individual control is similar to the supply sensible cooling units system except that throttling valves are used at each pair of coils. Chilled water supply for these units is obtained at 59F from the roof apparatus spray coils and is restricted from dropping below 56F by mixing with return water from each respective pair of return sensible cooling units.

The chilled water pump control consists of a bubbler type transmitter which measures the water in the chilled water sump and transmits the indication to a locally mounted sight glass which in turn indicates sump water level graphically. A recording thermometer with sensing element in the line leaving the chilled water pumps reads the entering water temperature on the central control panel in the boiler house. This master control panel is arranged to contain all of the recording controllers and tachometers needed for the refrigeration machinery. Each of the eight turbine driven refrigeration machines is equipped with a recording thermometer with sensing element in the leaving water line proportioning a throttling type governor oil valve varying turbine speed to maintain a fixed water temperature. The governor oil valve is closed if an unsafe condition arises.

Ventilation and Exhaust System

The four major areas that are subjected to very high concentrations of heat caused by their processes are isolated by erection of curtain walls which extend from the floor to the ceiling. Minimum openings are permitted in them for transportation of materials and personnel. All of the ventilation systems are handled essentially the same way. Wherever practical, hoods are constructed to collect the high heat loads and fumes given off and exhausted to the outside; duct systems, connected to fans located on the roof, introduce outside air at levels adjacent to personnel; and area exhaust fans on the roof remove to the outside any heated air that is not absorbed by the hoods.

One of the 1,100-ton centrifugal compressors. The writer is standing in front to give a comparative picture of size.

The constant balance is calculated to maintain approximately 5 per cent more exhausted air than outside air supplied, thus continually creating a negative pressure in each heat treatment area. This means that conditioned air from the plant constantly infiltrates through the fixed openings into each area. This is essential as a loss of air from the heat treatment areas to the plant would disturb the humidity and temperature control balance. To maintain the critical balance between the supply and exhaust air, the various fans are interlocked so that automatically starting an exhaust fan will start up a supply air fan of matched capacity. The quantities of air introduced in winter are controlled through variable air volume controllers to prevent uncomfortable conditions occurring during extremely cold weather.

Absorption System Serves Phoenix Hotel

Desert Hills, a hotel with 56 guest rooms located at Phoenix, Ariz., has installed a 25-ton gas-fired Servel water chiller in the main guest building. Steam operates the water chiller in the summer and a B & G heat exchanger is used during the winter season for heating purposes.

Individual room units receive the chilled water in the summer and hot water in the winter. During the hot months, temperatures in the guest rooms range from 74 to 76F, depending on the location of the rooms. Each room or suite has a thermostat which can be regulated by the occupant.

In Phoenix the temperatures may reach as high or higher than 120F outdoors, and an adequate reserve capacity is a a major necessity to bring indoor temperatures within the comfort zone.

According to a company engineer, "the difference in temperature between the outside and the inside is not the entire answer. When it is 120F outdoors, you certainly will not be comfortable indoors in a temperature of 100F. According to health authorities the comfort zone for most people is around 80F (with approximately 50 per cent relative humidity).

"It is a common misconception on that part of the public," he concluded, "that believes there should be a 15 or 20 degree temperature difference between outdoors and indoors."

With that in mind the engineers made a standard installation in the Desert Hills that would satisfy individual needs.

The water chillers utilize the Servel absorption principle. It is a hermetically sealed vacuum system that eliminates all moving parts. The refrigerant is water, and lithium bromide, an inorganic salt, is the absorbent. Steam from any source may be used to operate the chillers that are available in 25-ton models.

Air Conditioning Aboard Ships

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Covered in this article are the requirements for air conditioning on shipboard, the various methods for delivering conditioned air to staterooms, and design conditions to use for ships operating in different temperature zones. A design problem is included.

AIR conditioning for human comfort aboard ship began about 1933 with comparatively small systems for dining saloons and some de luxe cabins. A trend by the leading naval architects and the ship owners to completely air condition all large passenger liners started after World War II. This has been true of all the so-called luxury liners built in the United States since the war of which the SS United States is the most notable example. This added comfort is one of the features used to invite passenger traffic by the steamship companies. In addition to new ship construction, many fine passenger vessels now in service are expected to install air conditioning to compete with the newer ships. Officer's and crew's quarters on many American merchant vessels may also be air conditioned.

The general aspects of shipboard air conditioning are similar to hotel air conditioning where each space receives careful individual treatment according to its use. Besides the normal zoning usually encountered, there are fire zones to be considered aboard ship. Watertight bulkheads are another factor because they may not be penetrated by the air distribution system. In general, the same requirements and rules apply for these installations as are defined for cargo refrigeration systems.

Basic Design Data

The essential basic information needed to design a ship's air conditioning system consists of the following:

(1) The expected trade route, with possible ports of call which comprise the vessel's regular schedule, as well as any off-season cruises to other ports throughout the world.

(2) Complete details of the spaces to be air conditioned.

(3) Design conditions or degree of air conditioning required for the different classes of accommodations.

(4) Type and extent of automatic controls required.

(5) Space locations available for equipment.

A ship's ports of call are of primary importance in establishing outside design conditions and are also a factor in influencing inside design conditions. For vessels which normally operate in the temperate zone and make only occasional cruises into semi-tropical areas, the owners may not consider it necessary to design for heating at the extreme low outside conditions encountered in the temperate zones nor for cooling at the extreme outside conditions in semi-tropical harbors. When design conditions are not definitely specified, and until such time as standard design conditions are established for the various trade routes, the values shown in Table 1 are recommended. Some designers use other inside design conditions for shipboard air conditioning applications. However, experience dictates that conditions which produce a higher effective temperature do not provide good comfort air conditioning at either full or reduced loads. When centrifugal compressors are used, it is particularly important that design conditions be clearly defined in order to determine the exact cooling water temperature required which, in turn, insures sufficient compressor capacity.

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Air Conditioned Spaces

Spaces which are normally air conditioned include the following, listed in the order in which they are considered.

(1) Dining saloon, bar and lounge, barber shop and beauty parlor.

(2) Public spaces, writing rooms, libraries and Purser's office.

(3) Choice staterooms.

(4) All staterooms.

(5) Crew's quarters and mess rooms.

The size, type and number of systems depends on how much of the entire ship is air conditioned. In all cases,

TABLE I—DESIGN CONDITIONS

	Cooling				Heating		
	Outside		Inside		Outside		Inside
Trade Route	db,F	wb,F	db,F	rh,%	db,F	wb,F	db,F
Temperate (North Atlantic)	95	78	80	50	0	0	70
Semitropical	95	80	80	50	20	20	70
Tropical	95	82	80	50	20	20	70

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design factors in order of importance are: Reliability, flexibility, simplicity, space, weight and overall cost. Shipboard air conditioning installations should perform the normal air conditioning functions. While good ventilation is important, humidification, however, is seldom required. All air conditioned spaces should be properly insulated when adjacent to higher temperature areas such as weather decks, machinery spaces and galleys.

Heat transmission factors cannot be readily determined from data in common use because of the complex structures and high conductivity materials used in shipbuilding. Some typical transmission factors are published in Marine Engineering, Volume II, issued by The Society of Naval Architects and Marine Engineers. Such data are also available from the U. S. Maritime Administration and the U. S. Navy. For the other components of the load such as ventilation air, people and light, conventional factors are used.

Use of Zones

It is recommended practice to calculate the loads on the basis of zones and then tabulate a load summary. These individual zone loads are used to select the zone air cooling coils and fans. Since the total load for all the zones include more people than are actually aboard, a deduction is made for the excess people before the water cooling system is selected. Since there is a repetition of the number of passengers in calculating the cooling load for dining saloon, lounge and other public spaces, then for example, this repetition could show 3,900 persons for a passenger liner carrying 1,000 passengers and 500 crew. This is an excess of 2,400 persons which should be deducted from the total load on the water cooling system. However, when a reheat system is used, only the latent heat due to the excess number of people should be deducted from the water cooling load because the reheat coil adds heat equivalent to the people sensible load.

For small systems the refrigeration equipment usually consists of Freon-12 direct expansion or a Freon-12 water cooling system. For large installations comprising one or more systems where the capacity of each system is more than 200 tons refrigeration, a water cooling system is used with Freon-12 reciprocating compressors or with Freon-11 centrifugal compressors. As a general rule, it is recommended that for capacities up to 200 tons refrigeration, reciprocating compressors be used; for capacities between 200 and 300 tons refrigeration reciprocating or centrifugal compressors; and for capacities over 300, centrifugal compressors. It is good practice to interconnect multiple systems for emergency operation.

TABLE 2—SUMMARY OF STATEROOM SYSTEMS

Item	Conventional	Conventional with Reheat Coil	High Pressure Induction Unit	Fan Unit	Double Duct
100% outside air	Yes	Yes	No	No	Yes
Passageways—air conditioned	Yes	Yes	No	No	Yes
Heat and cool, simultaneously	No	Yes	Yes	Yes	Yes
Individual room temperature control	Limited by volume	Yes	Yes	Yes	Yes
Outside air filtered	Yes	Yes	Yes	Yes	Yes
Recirculated air filtered	Yes	Yes	No	Yes	Yes
Coils in staterooms	No	Yes	Yes	Yes	No
Fans and motors in staterooms	No	No	No	Yes	No
Separate heating and cooling coils	Yes	Yes	No	No	Yes
Piping in passageway	No	Yes	Yes	Yes	No
Condensate drains in room	No	No	Yes	Yes	No
Occupies floor space	No	No	Yes	Yes No	No
Comparative duct size*	Large	Large	Avg.	Avg.	Large

*With relation to minimum ventilation requirements.

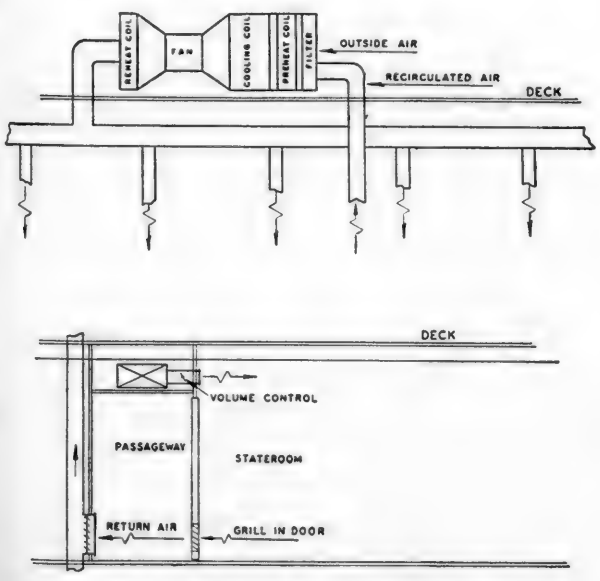


Fig. 1. Conventional air conditioning system.

Facts About Compressors

When the capacity of a water cooling system does not require more than two reciprocating compressors, the following factors should be considered:

The system components such as compressor, condenser and water cooler may be separately located in the available space to the best advantage whereas a centrifugal system must be installed as a unit.

When cargo refrigeration is also involved, it may be possible to use the same size compressors for air conditioning. This simplifies maintenance as well as onboard spares. In addition, the spare reefer compressor would also serve as the standby compressor for air conditioning.

The condensers and water coolers should be considered in like manner so far as practical. Obviously, such an attempt for uniformity should not be carried to extremes.

Although conventional water cooling systems are normally used for shipboard air conditioning applications, there may be cases when brine cooling systems should be considered. An example of this would be a ship plying a trade route where tropical as well as subfreezing temperatures would be encountered. The proper inhibitor should be added to the brine solution suitable for the duty.

Air cooling equipment selection depends on such factors as the amount of space available for fan rooms,

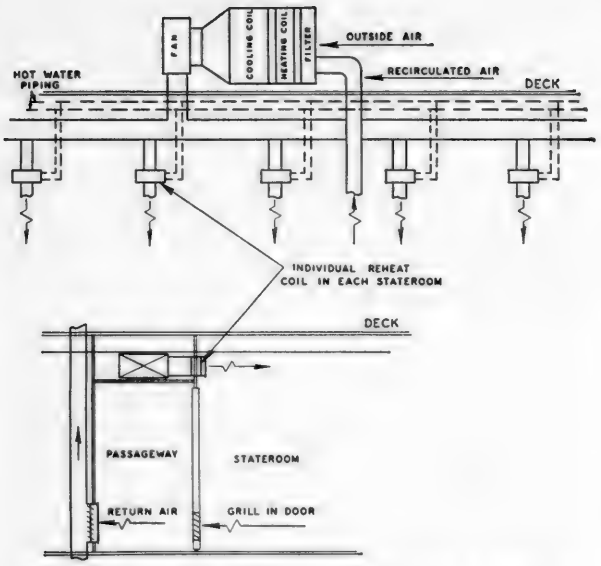


Fig. 2. Small reheat coil at stateroom outlet is added to conventional system.

vertical shafts and in passageways and what zoning can be used for similar exposures and fire protection. It is recommended that generous zoning be used and that each zone have its own accurately balanced air system with its automatic controls.

Zoning of Cabin Spaces

Zoning of the cabin spaces for officers, crew and passengers is determined according to their location, the ship's fire zoning, and the space available for the duct system. Limited passageway space generally prohibits the use of long horizontal ducts. Individual deck zones is the most desirable arrangement. However, several decks can be grouped vertically but this results in unbalanced return air due to the opening of outside doors. As a rule, a zone comprising three decks, extending the normal length between watertight bulkheads on one side of the vessel, is practical without duct sizes becoming too large, provided the vertical riser can be located about halfway between the bulkheads.

Careful planning is essential for good air distribution in staterooms. As a rule these loads are relatively heavy for the size of the space. Tests have shown that the most satisfactory location for supply air terminals is between and at the head of the berths. Low head room requires the use of diffusers for good air distribution. The layout of some staterooms may require different treatment but if drafty conditions and dead spots are to be prevented, the direction of air flow must not be towards the bulkhead at the head of the berths.

As previously mentioned, good ventilation is of primary importance for all shipboard air conditioning installations and this requirement applies to all occupied spaces. It is therefore imperative that all design details which in any way relate to ventilation be carefully considered from this standpoint to insure that minimum outside air requirements are met under all operating conditions. These recommended minimum outside air quantities are 10 to 15 cfm per person for public spaces and 15 cfm per person for officer, crew and passenger staterooms. In small spaces, the minimum air change or exhaust air requirements usually result in higher cfm per person.

In simplified form, five types of stateroom systems are shown. Among possible variations are separate outside air and exhaust air fans, which are recommended. A comparative summary is given in Table 2.

Fig. 1 shows a conventional air conditioning system consisting of a single fan and duct distribution system with outside air and recirculated air passing over preheat, cooling and reheat coils. Individual stateroom control, within limits, is achieved by volume control.

Fig. 2 is similar to the previous system but has a small hot water reheat coil at the outlet to each stateroom. An added feature is thermostatic control which can be adjusted by the room occupant. Each room has an individual control with a constant air supply. All outside air is automatically available for ventilation when conditions permit or the outside air can be manually controlled for emergency requirements. The artificial sensible load due to reheating at reduced loads has not been considered serious. At other than peak load conditions, good comfort conditions with minimum relative humidity is maintained at the room temperature desired by the occupant.

Fig. 3 is the high pressure induction system used for multi-story, multi-room applications to reduce duct sizes and save space. Shipboard installations are not as critical in this respect because of the zoning which must necessarily be used to comply with fire zones, deck and bulkhead boundaries so that duct sizes are relatively small.

The system shown in Fig. 4 is similar to the previous one except that each individual room unit contains a centrifugal fan. Filters are also included in the unit.

Fig. 5 is the double duct system which can be designed for either high or low pressure. One duct supplies hot air and another supplies cold air to a mixing chamber at each room. A mixing damper varies the proportion of hot and cold air supplied to the room. Automatic individual temperature control can be obtained.

For public spaces individual systems of conventional design as shown in Fig. 1 are in general use. Self-contained unit air conditioners suitable for shipboard appli-

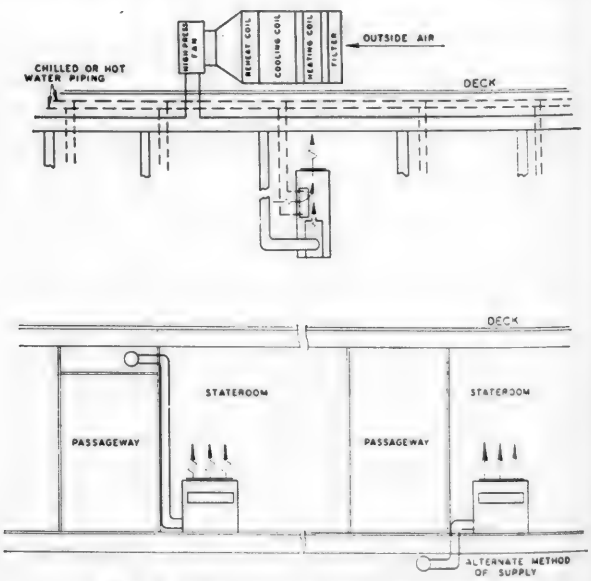


Fig. 3. High pressure induction system.

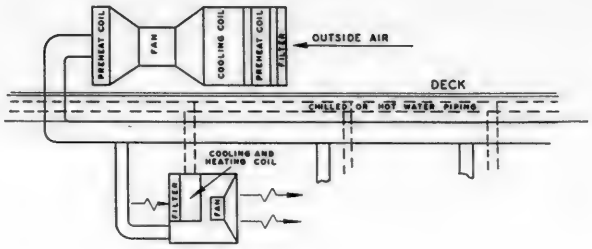
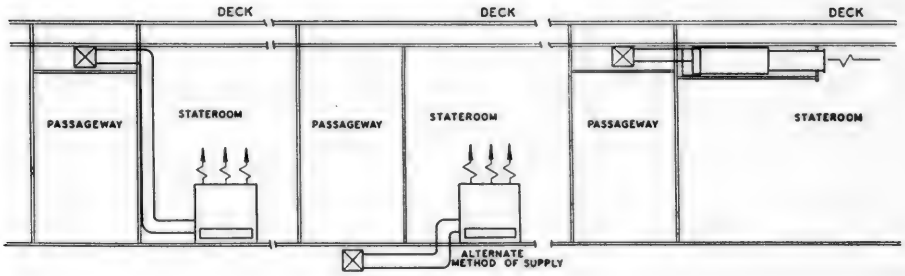


Fig. 4. Individual room unit with centrifugal fan, in connection with a high pressure induction system.



cation are also used for public spaces where requirements are within their capacity ranges.

Design Problem

For a design problem, consider that a passenger-cargo vessel is to be air conditioned during construction. The spaces include passengers' staterooms, public spaces, and officers' and crew's quarters.

In the following detailed load calculation, the dining saloon is used as a typical example. It measures 70 x 25 x 9 ft. Load from lights is 4,000 watts and the design is to figure on 125 persons. Design air conditions are: Outside, 80F d.b. and 76F w.b., inside, 75F d.b. and 65F w.b.

Load Calculations

Transmission

Forward bulkhead—70 x 9 ft = 630 sq ft exposed to 80F.

Aft bulkhead—46 x 9 ft = 415 sq ft exposed to 80F (balance of this bulkhead is adjacent to conditioned area).

Ship's side (sun)—25 x 9 ft = 225 sq ft exposed to 120F.

Ship's side (shaded)—25 x 9 ft = 225 sq ft exposed to 80F.

Deckhead—30 x 25 ft = 750 sq ft exposed to 80F (balance of deckhead under conditioned area).

Deck—70 x 25 ft = 1,750 sq ft exposed to 115F (over machinery space).

Calculations follow:

Area A		Factor "U"		Temp. Diff. TD		Btu per hr
630	×	0.37	×	(80-75)	=	1,165
415	×	0.37	×	(80-75)	=	770
225	×	0.18	×	(120-75)	=	1,825
225	×	0.18	×	(80-75)	=	200
750	×	0.43	×	(80-75)	=	1,615
1750	×	0.12	×	(115-75)	=	8,400
						13,975

Transmission: = 13,975 Btu per hr

Internal sensible load

People — 125 × 220	=	27,500
Lights — 4000 watts × 3.4	=	13,600
Fan motor — 1.5 Bhp × 2545	=	3,820
Outside air — 1875 cfm × (80-75) × 1.08	=	10,125
Total sensible load	=	69,025
	=	5.8 TR

Latent Load

People — 125 × 235	=	29,375
Outside air — 1875 × (130-77) × 0.68	=	67,690
Total heat load (sensible + latent)	=	166,085
	=	13.8 TR

$$\text{Multiplier} = \frac{13.8}{5.8} = 2.38$$

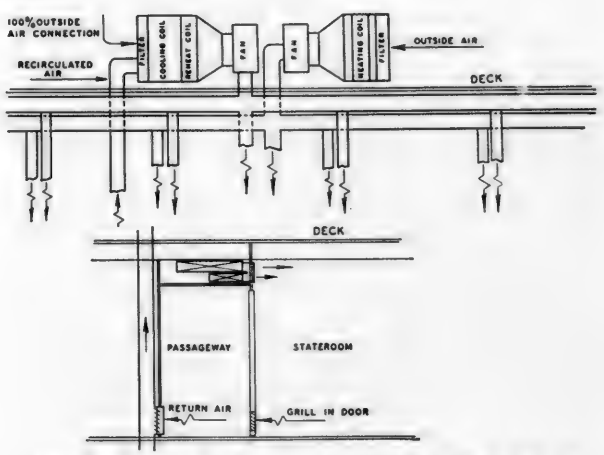


Fig. 5. Double duct system suitable for either high or low pressure.

TABLE 3—LOAD SUMMARY

Space	Sensible TR	Latent TR	Total TR	Multiplier	Area Sq Ft	Volume Cu Ft	Sq Ft per TR	Cu Ft per TR
Dining saloon	5.4	8.0	13.8	2.56	1750	15750	127	1140
Officers' mess	1.46	1.58	3.04	2.08	320	2880	105	945
Crew's mess	2.58	3.38	5.96	2.31	551	4959	92	832
Stewards' mess	1.19	1.24	2.43	2.04	264	2376	108	1020
Staterooms	10.6	7.15	17.75	1.67	7200	64800	405	3650
Staterooms	7.07	6.14	13.21	1.87	5300	47700	400	3600
Hospital area	11.6	9.73	21.33	1.84	1060	9540	50	450
Crew's quarters	5.26	2.12	7.38	1.40	2600	23400	350	3200
Crew's quarters	8.46	2.8	11.26	1.33	3950	35550	350	3200
Bridge and wheelhouse	3.15	0.36	3.51	1.11	492	4430	140	1260
Boat deck	2.29	0.64	2.93	1.28	1328	10600	450	3600
Boat deck	6.56	1.37	7.93	1.21	2898	23200	360	2930
Club room	2.39	2.26	4.65	1.95	228	2050	49	440
Music room and stewardess	0.99	0.34	1.33	1.34	87	780	65	580
Totals			116.51		28028	248015		

Note: This load summary includes a total of 549 people whereas there are 270, amounting to an excess of about 9 TR, which was not deducted from the refrigeration load.

Refrigeration Load

Heat load (Table 3) 116.5 tons

Pump: $\frac{6.5 \text{ Bhp} \times 2545}{12{,}000}$ = 1.4 tons

Line losses: 2% × 117.9 = 2.4 tons

Total 120.3 tons

Equipment Selection

Water cooler. The cooler was selected for 120 TR cooling 312 gpm of water to 45F.

gpm/ton 312/120 = 2.6

Water temperature range 24/2.6 = 9.2F

Temperature water entering cooler 45 + 9.2 = 54.2F

Minimum required surface 6 × 120 = 720 sq ft

Smallest cooler selection is 22 inches dia × 12 ft long having 881 sq ft of surface. A 2-pass cooler has a maximum water quantity of 435 gpm at 8 psi pressure loss.

Sq ft surface per ton 881/120 = 7.35

For a 2-pass cooler, 2.6 gpm/ton and 7.35 sq ft per ton, temperature difference = 8.3F

Evaporator temperature 45 −8.3 = 36.7F

Percent maximum gpm $\frac{312}{435} \times 100$ = 71.7

For a 2-pass cooler and 71.7% maximum gpm, pressure loss = 4 psi

Compressor.—One type 3169-9 DE unit was selected. At 36.7F evaporator temperature and 105F CT, the compressor selected has a capacity rating of 128.6 TR requiring 137 Bhp. A 150 hp motor was used.

Condenser. One 24-inch dia × 8 ft long 4-pass condenser with 520 tubes was selected.

With 4.2 gpm/ton 128.6 × 4.2 = 540 gpm

Water temperature rise 30/4.2 = 7F

Where 30 = gal. deg per ton

Leaving water temperature 85F + 7F = 92F

Small temperature difference 105 − 92 = 13F

From scale rating curve, 13F small difference requires 5.3 sq ft per ton.

Total sq ft required 128.6 × 5.3 = 682 sq ft

Tube velocity $\frac{540}{130 \text{ tubes/pass} \times .682}$ = 6 fps

Where .682 is a constant based on the basic formula for fluid flow: Q = Va

From design curve, pressure drop = 5.72 psig

How to Write a Complete Insulation Specification

MARSHALL F. ALLEN

Manager, The Magnesia Insulation Manufacturers Association

In order to be sure of a good job of thermal insulation and realize the highest return for each dollar invested, an insulation specification should be complete. It should tell the contractor exactly what is to be insulated, what types of insulation are acceptable, and how these are to be applied. The method of application is as important to the comparison of competitive bids as the insulating material itself. Here are the points to consider.

THE first step in specifying insulation is to draw up a detailed list of all equipment and piping which operates at a temperature above or below ambient temperatures, and indicate why each unit is to be insulated. In most instances, the foremost reason is the conservation of heat so as to reduce heat costs. A second reason is one of safety, either to protect personnel against being burned or to guard flammable materials against ignition by contact with a hot surface. Third, insulation may be applied to keep personnel comfortable by reducing the amount of heat escaping into a working area. Still another reason is to prevent condensation or freezing. By keeping the purpose of the insulation in mind, the suitable material and thickness to be applied will be indicated.

The next consideration is the insulating material to be used. A quality insulator is always more economical for an installation with any appreciable life span. It should have the lowest conductivity rating (k factor) consistent with long life; it should be resistant to normal mechanical damage, resist compression in order to maintain its original thickness, handle well and be easy to apply. Further, the insulation should show no detrimental physical or chemical changes when exposed to rated temperatures, should be free from organic substances which might carbonize, rot, or disintegrate, and in many cases should be highly fire-resistant.

As a general rule, insulation applied for reasons of safety or comfort does not need to be as thick as insulation applied to conserve the optimum heat. When it is a case of insulating for maximum heat savings at minimum overall cost, several factors such as operating hours, fuel charges, conductivity and applied cost of various insulation materials and thicknesses need to be considered in order to arrive at the most economical thickness for each piece of equipment, and pipe run. This thickness is the one for which the yearly total cost—amortized cost of applied insulation plus yearly cost of lost heat—is the lowest. It is not always necessary to calculate these thicknesses, for qualified insulation manufacturers and contractors often have economical thickness tables on hand which have been prepared for average conditions from current data. These values are readily adapted to existing conditions. Note that only one square foot of surface at 140F in a room at 70F will waste the equivalent of 124 lb of coal per year. Therefore, an extra ½ inch of insulation often pays for itself through higher heat savings.

The next important consideration in preparing a complete specification is in outlining the exact application techniques and finishing materials to be employed. Several factors will influence these decisions, among them the life expectancy of the plant and therefore of the insulation, whether equipment (or piping) is located indoors or outdoors, whether these are exposed or concealed, as in crawl spaces, and whether the insulation is out of harm's way or located where it might suffer mechanical damage. Concealed surfaces should be in-

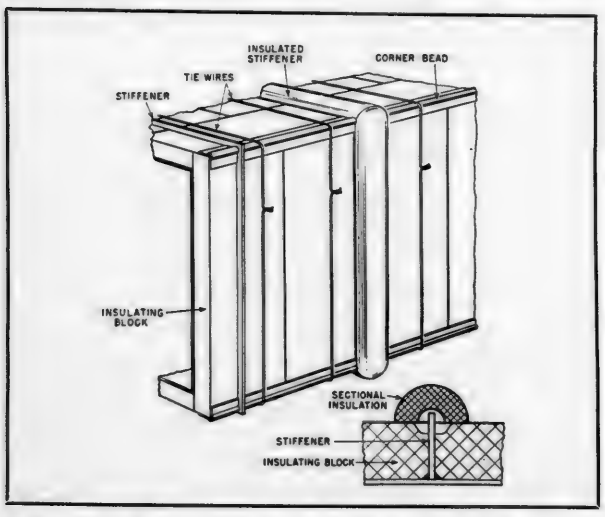
Typical service opening in equipment where insulation is subject to damage during maintenance operations. Notice bevel of insulation around bolted cover to allow for easy removal.

Sheet metal jacket bolted over steam line to protect the insulation from damage.

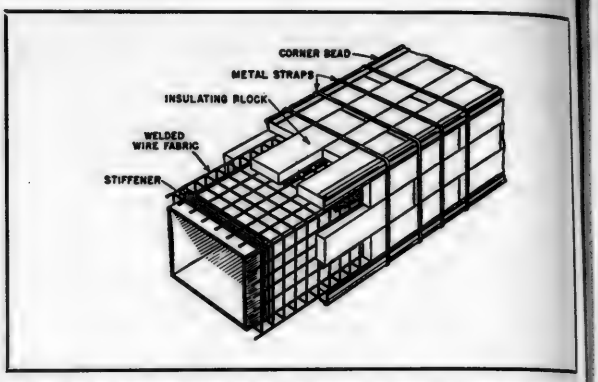
sulated with particular care since re-insulation in such cases is often more expensive than the original job.

Piping Insulation

Several types of piping insulation, such as 85% Magnesia for example, are available with a factory-applied lightweight canvas jacket. By simply pasting down the side and end laps of canvas and banding or wiring the insulation, a satisfactory application for many conditions can be achieved at minimum cost. Whereas black lacquered steel bands will serve in many cases, it is advisable to specify special non-corrosive bands or wire whenever piping is located in particularly corrosive or moist atmospheres. At least three bands of wires per section of insulation should be called for.



Detail of duct insulation when stiffeners project beyond insulation.



Welded wire fabric (road mesh) over duct stiffeners provides flat surface to which insulation may be applied.

When temperatures encountered are sufficiently high to warrant it, double-layer insulation should be specified. Materials and thicknesses for the inner and outer layers should be given, and the specification should require that the joints of the second layer be staggered with respect to the first, both longitudinally and transversely. This avoids direct paths for heat escape, should thermal expansion cause some of the insulation joints to open.

If the installation calls for greater protection or if the insulation application is to give the longest possible service with only a minimum amount of maintenance, a heavier canvas jacket may be specified. Eight-ounce canvas is usually applied over a wrap of rosin-sized paper, and all seams are securely lagged or cemented. For appearances, the seam should be where least visible, i.e., on the side facing the wall or ceiling. Where necessary joints or openings in insulation should be pointed up with asbestos insulating cement before the finish is applied. This type of application is very durable. In fact, the insulation at the Hotel Astor in New York City, applied in this manner over fifty years ago, is still in serviceable condition.

If some of the piping is located outdoors, the specification should state the weatherproofing materials to be applied. A jacket of asphalt-saturated asbestos felt, weighing not less than 45 lb per 108 sq ft, is recommended for most applications. The jacket should be lapped at least three inches at all seams, and on vertical lines only seams sealed with an asphaltic plastic weatherproofing compound. Horizontal joints should be lapped downward so as to shed water, and the jacket secured with corrosion resistant wire or bands at least every 6 inches.

Piping subject to mechanical damage should be protected with a sheet metal jacket of galvanized iron or other corrosion resistant sheet metal.

Equipment Insulation

Heated equipment has many shapes, dimensions and functions that call for different application techniques. Boiler walls, dished ends of vessel, conical tanks, rotating or vibrating equipment and other special cases require special methods. Those situations most frequently encountered are described and pictured in the application manuals[1] of most suppliers.

[1]For instance, The 85% Magnesia Manual and a model specification for the insulation of heating systems in commercial and institutional buildings, and multiple dwellings are available from The Magnesia Insulation Manufacturers Association, Washington, D. C.

Insulating blocks being applied to an autoclave at a pharmaceutical research center.

The more common problems and the basic steps taken to meet them can be described.

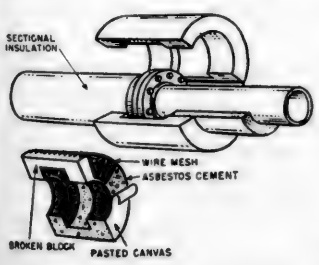
Cylindrical vessels or tanks should have insulation blocks or lags secured in place with bands or wire on 12-inch maximum centers. Vertical tanks or vessels have the problem of insulation slippage and supports should be provided on which the vertically placed blocks can rest, the number of supports being governed by the height of the tank. In the case of horizontal tanks, sagging of the insulation on the bottom third is a problem. Channel irons or clips or studs welded to the sides of the tank permit the use of extra band or wire supports on this lower part of the insulation.

In all cases where special anchors—rings, studs, bolts, hex nuts, etc.—are called for, the specification for the equipment or insulation or both should indicate when and where supplier is to furnish and affix them.

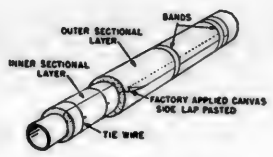
On very small or irregularly shaped equipment, where the use of block insulation is impractical, insulating cement should be specified. No insulation should be applied over name plates, but should be beveled off around them. Similarly, insulation on cover plates, heads of equipment, or other openings, should be cut back so that the bolts may be removed without disturbing the insulation. Specifications should call for strap iron edging at such points to protect insulation against mechanical damage during maintenance operations.

In specifying insulation for large surfaces subject to very high or widely fluctuating temperatures, the effects of thermal expansion must be taken into account. Expansion joints should be provided, and the specification should give location and details.

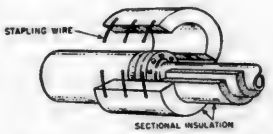
Equipment insulation is generally finished with one layer each of asbestos insulating and asbestos hard finish cement keyed to a previously applied layer of wire mesh. The specification should designate the type of wire mesh, the thicknesses of cement to be applied—usually ¼ in. coats—and should also say whether or not a final jacket



One method of insulating a flanged joint.



Technique of applying insulation to straight pipe.



Insulation over flanged joint may be removable.

of canvas is to be pasted or sewed on. If equipment is located out of doors, the weatherproofing finish to be applied should be completely described.

Duct Insulation

If the surface of the duct has no stiffeners or other projections, insulation may be applied in the same manner as in insulating other equipment. The specification should mention the use of corner beading, to prevent bands (or wire) from cutting into the insulating blocks and also to guard against subsequent mechanical damage. On larger ducts special anchor-studs such as hex nuts should be welded on the sides and bottoms to secure the insulation.

If stiffeners are widely spaced and do not project more than the thickness of the insulating blocks, the latter may be applied directly to the ductwork. By butting them closely against the stiffeners, and filling the joints with insulating cement, a smooth, continuous surface may be obtained.

If stiffeners are widely spaced and project beyond the desired insulation thickness, sectional pipe insulation may be wired over the projecting portion of the stiffeners.

If stiffeners are closely spaced, it is usually most advantageous to weld or otherwise fasten metal strips, road mesh, or v-rib metal lath over the stiffeners to present a flat surface for the insulation. The specification should clearly indicate which method is to be followed.

The same suggestions apply in specifying insulation for breechings, uptakes, or flues.

Insulation of Flanges, Valves, and Fittings

Flanges, fittings, and valves are usually insulated with pipe and/or block insulation if in pipe lines larger than a 4-in. diameter. If in smaller lines, the use of insulating blocks is impractical, and insulating cement should be specified.

In some instances it may be desirable to specify removable insulation on flanged fittings or valves. This simplifies maintenance operations in that the insulation may be taken off without damaging it and replaced when repair work is completed.

Insulation finish should be asbestos insulating and asbestos hard finish cement, with or without an additional canvas jacket. Out of doors the finish should be a layer of asphalt-asbestos weatherproof plastic, applied over one layer of hard finish asbestos cement. Total thickness of insulating and finishing materials on flanges, fittings, and valves, should be the same as that specified for adjacent piping.

The specification should say whether or not the completed insulation is to be painted, and whether this is to be done by the insulation contractor or not.

Still More About Relief Valves

T. W. REYNOLDS

AN analysis of boiler flue condensation which I made in the July, 1953, issue of HEATING AND VENTILATING soon became diverted to a discussion about the right size of relief valves by a correspondent objecting to a boiler incident reported to me from a location about as remote from my habitation as possible. The correspondent then investigated the incident as further reported in the November issue.

Now a second correspondent presents an analysis which shows that the simple looking relief valve has much more background than we commonly think. Finding myself without laboratory support and between the opinions of specialists, I offer only a single observation: Gas-fired boilers tend to small water content and to small size in mild climates, hence it would seem that a relief valve can relieve a considerable amount of water from below by flash down to atmospheric temperature.

In the following, the second correspondent objects to the statements in italics:

"'*In many installations, a single relief valve may be of proper size for adequate relief, yet become a source of considerable damage due to over-relief from over-size.*'

This statement cannot be substantiated by fact.

"For more than two years, the writer's company has manufactured a full line of ASME hot water boiler safety relief valves, with sizes up to 2 inches, so that boiler requirements can be fully met by a single valve. Many of the large size valves have since been installed throughout the country, and we have yet to hear of a single case of so-called over-relief. Furthermore, we do not expect to ever hear of such a case, because an ASME water relief valve (ours or any other and regardless of size) cannot discharge any more than the surplus volume of water resulting from thermal expansion provided, of course, that the valve is not held open by foreign matter on the seat.

Roof Installation

"The third paragraph citing a case instance is not logical in its analysis, '*A roof installation of a boiler is quite apt to be gas-fired. One such installation with a 2,000,000 Btu input and only 100-gallon water capacity had a single 2-inch relief valve. When the expansion tank became water-logged, the system built up a pressure sufficient to open the relief valve with a bang, thus suddenly relieving nearly all the boiler water over the boiler room floor.*'

"Since this boiler is installed on the roof, it follows that most of the water in the system is in the building below. This means that only the water content of the header and the expansion tank are above the relief valve and, therefore, subject to gravitational flow out of the relief valve. But, this could only occur if foreign matter prevented the valve from closing. In any case, the water in the boiler could not have been drained below the level of the relief valve because there could not have been a force or energy of any kind to lift it out through the relief valve.

"As regards the relief valve opening with a bang on thermal expansion pressure, this denotes an obvious misunderstanding of the physics of thermal expansion. The volume increase in water as it is heated is actually very small—roughly about 2½% for every 100 degree rise. Also, it does not occur suddenly, but instead it is gradual because it is proportionate to the temperature rise.

"However, the pressure rise is extremely rapid when water is heated in a closed vessel because water is practically incompressible. If the system is completely full and no air is present, the pressure can increase by many pounds for each degree of temperature rise. But, by the same token, the release of a relatively small amount of water also drops the pressure very quickly. As this small amount of water is discharged, the pressure drops to slightly below the relief valve setting and allows it to close again. Water pressure is positive because of its incompressibility, and only that water which is displaced by volume increase can be discharged by the relief valve. A water relief valve opens proportionate to the amount of water to be discharged. There is no bang.

Opening of Steam Valve

"On the other hand, a steam pressure safety valve does open with a bang because steam pressure is a cumulative pressure which can be likened to a coil spring. Because steam is compressible, it has the power to maintain its pressure for a brief period, when it is released through a restricted orifice and to expand approximately 1,700 times upon reaching the atmosphere. It is this swift expansion that causes a steam safety valve to pop and also the steam relief feature of an ASME safety relief valve to pop. Obviously, the water relief function and the steam relief function, both of which are found in ASME safety relief valves, are being confused.

"As regards the next sentence, '*The velocity of the escaping water was sufficient to hold the float of the low water cut-off in the closed position,*' the fact that a low water cut-off is a float-operated device indicates that the float must be in water to be held in a closed position. Why didn't the cut-off work when there was no water to support the float?

"But, even more unrealistic is the velocity theory. Since the water alleged to have been gushing out of the relief valve was coming from above, it would have a tendency to push down on the float, which, of course, would break the electrical circuit to the burner. However, if the cut-off was connected, as shown in Fig. 2 (HEATING & VENTILATING, Nov. 1953, page 87), it couldn't be exposed to velocity in any direction. With or without velocity, the buoyancy of a float will hold the switch in closed position. To attribute the cut-off failure to the relief valve is beyond sound reasoning.

(*Concluded on page* 158)

Review of Outstanding Law Suits

LEO. T. PARKER

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Brief reviews of interesting higher court cases are presented to serve as guidance for heating contractors and others in avoiding expensive litigation.

DURING 1953, the higher courts in different states decided many unusually important decisions affecting heating contractors, and buyers and sellers of heating supplies. These outstanding law suits are briefly reviewed that readers may avoid expensive legal controversies. Obviously these new higher court citations may be used advantageously by readers and their legal counsel to win unavoidable suits. One who may desire to read any complete decision cited hereinafter may do so at any good library, simply by reference to the citation given.

Contractor Follows Plans

According to a late higher court decision, a heating contractor can rely upon specifications given to him for the purpose of submitting a bid. If the resultant heating system is inefficient or defective, the contractor cannot ordinarily be held liable.

For illustration, in Staley v. New, 250 Pac. (2) 893, the testimony showed that a contractor signed a contract for the installation of a heating system in a dwelling. Further testimony disclosed that the property owner had consulted a friend regarding the kind of heating system desirable for use in the house and he recommended radiant heating. Shortly thereafter the friend contacted an architect and requested him to draw plans and specifications for a radiant heating system. These plans and specifications were paid for by the property owner and also added to the cost of the house.

Shortly after the property owner moved into his new home, he discovered that the heating system did not function correctly, in that it did not heat the house adequately. Complaint was made to the heating contractor relative to the existing defect. Although several efforts were made to adjust the same, it never did work and it was then that the property owner sued the contractor seeking damages of $5,500.

The higher court refused to hold the heating contractor liable, saying:

"It is clear from the evidence that the contractor submitted his bid based upon a copy of the plans and specifications prepared by the Harmon Corporation (architect). Manifestly it would be inequitable and unjust to hold that a general contractor or a subcontractor cannot rely upon specifications given to them for the express purpose of submitting a bid. The rights of the parties are to be measured and determined by the particular set of plans and specifications upon which the contractor and subcontractor submitted their bid. A contractor who bids for work is bound only by the specifications which are shown to him at the time he bids, and upon which his bid is based . . ."

Another case is Adams v. Tri-City Amusement Company, Inc. 98 S. E. 647. Here a higher court held that a contractor, being obliged to follow the plans and specifications furnished as his guide by the architect as the agent of the owner, was not responsible for defects in the final work.

Extent of Damage

Considerable discussion has arisen from time to time over the legal question: If a heating contractor installs a defective heating system, what amount of damages can the property owner receive from the contractor? Recently, a higher court clearly answered this legal question.

For example, in Rino v. Statewide Plumbing & Heating Co., Inc., 262 Pac. (2d) 1003, the testimony showed that one Rino was having constructed a warehouse building, 80 ft wide and 120 ft long. Rino entered into an oral contract with the Statewide Plumbing and Heating Company, Inc. whereby the latter agreed to design, furnish and install a proper and adequate heating system in said building.

The heating plant installed by the heating company consisted in a general way of a boiler, oil burner, tanks, pipes, ducts, blowers and other installations incident thereto. The heating system as installed did not work satisfactorily and periodically exploded, throwing smoke and soot on the walls of the building and on merchandise. Upon the complaints of Rino, the company made changes from time to time in the heating plant but such changes did not remedy the inadequacy of the heat furnished or cause the system to work satisfactorily. Finally, Rino sued the heating company to recover damages for breach of contract. Rino alleged he had paid $4,278.44 on the contract price of $5,991.57; had paid out $3,315.08 in an effort to correct the faulty heating plant; and had suffered a loss of $1,500 by damage to his merchandise. He asked for a judgment for these amounts, or $9,093.52. Before the suit was filed, Rino installed a coal-burning plant at a cost of $2,475. Upon the trial, the jury returned a verdict in favor of Rino in the sum of $2,500.

The higher court reversed the verdict and ordered a new trial to determine reasonable damage allowances to Rino. The court said:

"It is not denied that the heating system failed to function properly and adequately. The measure of damages generally under circumstances such as we find in this case is the difference between the contract price and the reasonable value of the heating system actually installed. However, in the instant case, respondent (Rino) has not paid the full contract price and the measure of his damages, if he be entitled to recover, is the difference between the amount actually paid by respondent (Rino) and the reasonable value of the heating system received. In addition, respondent (Rino) would be entitled to recover for any special damages sufficiently alleged and proved."

This court, also, held that if it is possible to repair a

defective heating system and make it operate and function in strict accordance with a guarantee given by the contractor, the property owner may recover a measure of damages equal to the expense of making the system conform to contract requirements.

Employe Falls Through Plaster

According to a leading higher court decision, all contractors and owners of real property have a legal duty to warn all persons, who lawfully use the premises, of existing and not clearly apparent dangers. This rule of law applies to employes who work for contractors.

For example, in Miller v. Brunsaw, 250 S. W. (2d) 958, the testimony showed facts as follows: A contractor was employed to install equipment in a building. One of the contractor's employes, who was working on a ramp, was seriously injured when he stepped upon and fell through what appeared to be solid flooring, but was insecure plasterboard.

In subsequent litigation the higher court held the injured employe entitled to recover $30,000 damages from the property owner. The court explained that anyone who owns unsafe premises must use reasonable care to warn employes, and all others, of obscure dangers. His failure to do so will result in an award of damages to an injured person.

Must Use Care

According to a late higher court decision a heating contractor must exercise at least an ordinary degree of care to perform efficient work. His failure to diligently exercise this degree of care will ultimately result in a damage allowance to his considerable financial loss. This rule of law is applicable to any and all kinds of work performed by the contractor, or his employes.

For example, in Baldridge v. Wright Company, 96 N.E. (2d) 301, the testimony showed facts as follows: A contractor was employed to make a connection between a gas line and a gas water heater in the basement of a dwelling. The contractor's employe wired open the automatic shutoff valve on the heater to secure the desire flow of gas, thereby destroying its effectiveness as a safety device. Later the gas fire under the water heater went out, and the property owner was injured by an explosion when attempting to relight the fire.

The higher court held the contractor liable in damages to the property owner because the evidence showed that the contractor's employe in wiring open the valve was negligent and was the proximate cause of the explosion. The court said:

"The undisputed testimony shows that the plaintiff (property owner) employed and paid defendant (contractor) to make the gas connection and had a right to assume that this would be properly and safely accomplished."

Surety Contract Void Unless in Writing

A few weeks ago a higher court held that a verbal or oral guarantee that another person will pay his debt is void.

For example, in Artic Air Conditioning v. Schmall, 57 N. W. (2d) 287, these facts were disclosed: A woman named Schmall made a written contract with a general contractor for the construction of four duplexes on her premises. The contractor put up a bond guaranteeing the performance of his contract in accordance with the drawings and specifications. The contractor subcontracted to Artic Air Conditioning the furnishing and installation of the heating systems in these four duplexes. The subcontractor, Artic Air Conditioning, started the work of installing eight gas furnaces in these four duplexes, a separate heating plant for each unit. The subcontractor had some trouble getting money from the general contractor and refused to complete the job. Schmall told the subcontractor that she wanted to get the furnaces installed as it was getting cold and she wanted to get the apartments finished and rented as soon as possible. He advised her that he would not do anything further until he received some money. Then Schmall said: "You don't have to worry. I'll see you get your money." In other words, Schmall verbally guaranteed that the Artic Air Conditioning, the subcontractor, would be paid the full contract price for installation of the eight heating systems. The work of installation was started within two days after this conversation.

The subcontractor sued Schmall for the money due for installation of the furnaces after the general contractor refused payment. In holding Schmall not liable, the higher court said:

"Any other promise by a third person (Schmall) to pay the debt must be in writing, otherwise it is void by operation of the provisions of the statute of frauds."

This court explained that under no circumstances is any person liable as surety to pay another person's debt unless the obligation is in writing.

The subcontractor argued that even if Schmall's promise is void to pay for the furnaces, and their installation, yet Schmall should be held liable for payment because she is now benefitting from use of the heating systems. In this respect, the higher court said:

"Although the promise is void, can defendant (Schmall) be held liable for the fair and reasonable value of the furnaces solely because she is the owner of the premises and, because thereof, received the benefits of their installation? We think not. Neither will defendant (Schmall) be unjustly enriched by reason thereof as she has paid the contract price for the duplexes, which included the furnishing and installation of the furnaces."

Three Months Is Reasonable Delay

Recently a higher court held that delay of three months by a property owner in rescinding contract for installation of an unsatisfactory heating system is reasonable and does not forfeit the property owner's right to rescind.

For example, in Elias v. Walker, 256 Pac. (2d) 298, the testimony showed facts as follows: A property owner named Elias signed a contract with a heating contractor for the installation of a heating system. Before the contract was signed, the contractor represented that he would design and supply a satisfactory system. The installation was made in accordance with the contractor's design and was practically completed early in October. In response to complaints by Elias, the contractor attempted to improve its operation. Finally, on December 26, Elias determined that the plant would not heat his premises ade-

quately and ceased using it. January 3 he notified the contractor of his rescission of the contract. The contractor refused to accept the offered return of the heating equipment or to repay the purchase price to them. Then Elias filed suit against the contractor to rescind the contract for the purchase and installation of the furnace and heating system.

The contractor attempted to avoid liability on the argument that the property owner's delay of three months in rescinding the contract was unreasonable and forfeited his legal right to rescind the contract. The higher court refused to agree with this argument and in holding the contractor liable, said:

"Plaintiff (Elias) did not know of the breach of warranty when the heating plant was installed. When he complained to defendant (contractor), he stated that it could be adjusted to heat the building. Elias decided to rescind the sale and notified defendant (contractor) of that election within a resonable time. He did not waive their right to rescind. Diligence in rescission is a relative question, and whether or not there has been an unreasonable delay in a given case depends upon the particular circumstances of that case. Use of the heating equipment for a temporary period was necessary in order for plaintiff (Elias) to determine its adequacy. Delay in the decision to rescind, induced by the promise of the seller to make the equipment comply with the warranty, cannot result in a waiver of the right to rescind."

Also, it is interesting to know that the higher court ordered that the contract be rescinded, and awarded Elias (1) the purchase price of the equipment, with certain interest at the legal rate; (2) the cost of repairing the walls and floors of the house, where air ducts were placed by the contractor; and (3) rental for storing the equipment until removed by the contractor. In this respect the court said:

"Upon rescission of a contract, the parties shall be restored to the position they occupied before the contract was made, as far as is practicable."

Must Prove Case

A reader asked this question: "If a contractor contracts to do a job for a definite price and later wants payment for extra work or materials, what must he prove to have a favorable verdict?"

According to a late higher court decision, unless he proves that the extras were ordered by the property owner, and not needed to complete the job he contracted to do, he cannot recover payment.

For example, in Wise v. Bruno, 50 Sou. (2d) 310, a heating contractor sued a property owner for extra payment for installing a water heater. The lower court refused to allow the extra payment, and the higher court approved the verdict, saying:

"We find a dispute as to whether they were made necessary by the demands of the defendant (property owner) or whether they resulted from the fact that a certain part of the work was not done satisfactorily and had to be replaced. Since the judge decided this issue against plaintiff (contractor) and did not allow for the extras, we have decided to make no allowance here. We cannot say that the conclusion reached by the trial judge on this issue was obviously erroneous."

Don't Rely on Oral Contract

Few heating contractors realize the importance of reducing all contracts to writing. Recently a heating contractor asked: "If I make a verbal installation contract, can I sue the property owner and recover payment?"

The answer is: Yes, if you can prove by disinterested witnesses the exact contents of the verbal or oral contract. Otherwise you can recover only what the court believes you earned, which is the normal value of the heating system.

Law of Guarantees

Recently, a higher court rendered an unusually important decision, establishing law as follows: (1) if a manufacturer tells a prospective purchaser that certain merchandise is designed to do something, there is no guarantee; (2) if a prospective purchaser inconveniences himself to inspect merchandise after listening to the seller's warranties, there is no guarantee; (3) if a purchaser sues a seller for damages he cannot introduce oral testimony to show or prove that the seller practiced fraud.

For example, in Perry v. Magee, 253 Pac. (2d) 488, the testimony showed facts as follows: A buyer named Perry entered into a conditional sales contract with a manufacturer for the purchase of the Magee Poster Drier for $5,098.50—$3,300 down payment and $158.51 to be paid in 11 monthly installments beginning December 1. This contract was made October 3. Five months later, on March 3, Perry notified the manufacturer that he was rescinding the contract upon the ground of misrepresentation and breach of warranty of quality, offering to return the machine upon the condition that his money be refunded. The manufacturer did not act and Perry filed suit alleging oral fraudulent representations made by the manufacturer's salesman as to the quality, efficiency and durability of the drier. In this respect the higher court held that Perry could not prove by oral testimony that the seller made false representations where Perry is asking for damages. The court said:

"Parol evidence is admissible to prove fraudulent representations in the procurement of a written contract for the purpose only of rescission but not for damages for fraud."

Further testimony showed that after the manufacturer had represented that the new machine could be successfully used for multi-color operations and that the paper would be moist enough to fold without injury to the paint, Perry was doubtful and took a trip to inspect a machine in operation. Hence, the court held the manufacturer not liable on a guarantee, and said:

"The respondent (Perry) did not believe these statements and, because of his disbelief, he accompanied Huff (manufacturer) to Seattle to inspect the Marshall machine which was in operation there. No actionable fraud is shown where a party makes his own inspection before the contract."

Also, the testimony showed that after Perry had returned from inspecting the drier the manufacturer had stated to Perry that the drier and its heating element was "designed" to operate efficiently and satisfactorily. In holding the manufacturer not liable on a guarantee, and that Perry must keep and pay for the drier, the court said:

"This is essentially based on respondent's (Perry's) testimony that Huff (manufacturer) represented to him that the new Merco tube was "designed" to remove these difficulties. All the witnesses agreed that the new tube was designed for that purpose."

Contractor Liable for Injuries

The courts hold that a heating contractor is liable in damages for injuries caused a reasonably careful person due to negligence of the contractor's employes.

For instance, in Rawls v. Tansil, 255 S. W. (2d) 973, it was shown that a heating contractor was engaged in installing a floor furnace in the living room of a dwelling. When the noon hour arrived, the workmen had cut the hole in the floor but had not completed the installation. Instead of covering the hole with boards or other substantial covering, the workmen merely placed a chair over or near the hole. A person named Tansil was seriously injured when he fell through the hole.

In subsequent litigation, the higher court held the contractor liable in heavy damages to Tansil.

Building Burns Down

According to a late higher court decision, unless the evidence is strongly against a heating contractor, a jury will not be permitted to decide whether he is responsible and liable for damage or destruction of a building caused by his negligence when installing a heating system.

For instance, in McAtee v. Holland Furnace Company, 252 S. W. (2d) 427, one McAtee sued the Holland Furnace Company for $28,000 damages for the destruction of her house and its furnishings by fire. McAtee alleged that the company's negligence in installing a furnace in her home caused the fire.

During the trial no witnesses testified positively that the company's employes did anything that caused the fire. In fact, the only testimony given by McAtee was that a neighbor upon being informed the house was on fire rushed upstairs and "the fire was right in the roof under the flue"; that it was a brick house with a shingle roof and there were no utility wires of any kind up there where this fire started." Another witness testified there was no other fire in the house that day except in the furnace and "it wasn't unusually big." McAtee's husband testified that "the draft didn't operate as it should, soot formed up in the flue, and when the furnace door was open soot would fly all over the building."

The lower court refused to permit a jury to render a verdict and held the Holland Furnace Company not liable. The higher court approved this verdict, saying:

"There is no proof to sustain the averments that the company 'carelessly and negligently installed this furnace and had replaced parts carelessly and negligently'."

Hot Water Heating Serves Evanston Apartments

A heating system which is said to be both efficient and economical in operation, has been achieved for the Ridge-Austin apartment building in Evanston, Ill., a suburb of Chicago. Mark D. Kelischer, the Chicago architect who designed the building, claims that it is one of the most luxurious apartment buildings to be built in the Chicago area for many years.

The structure is a four-story building, completely fireproof. It is contemporary in line and contains fourteen two-bedroom, five-room apartments. A combination of reinforced concrete, brick and a liberal use of glass block in the stair wells and at the entrance ways help to make the building distinctive. The building is heated by a forced flow hot water heating system with unusual features to promote good operation and to help reduce the cost of heating this building.

According to the architect, the building is being heated at almost half the cost of heating comparable floor areas in the Chicago vicinity. Good construction is partly responsible. Selection and design of the heating system are also important factors in the savings.

The architect made sure that the top floors would be furnished ample heat from an adequate heating plant by not stopping the risers at the fourth floor of the building as would be the usual procedure. Instead, he ran the risers up to the pent houses on the roof, eliminating any possibility of air in radiators instead of warm water on any apartment level. Another thing he did was to supply each heating zone with its own valve so that it is unnecessary to overheat apartments on first risers to properly heat those radiators on outside ends. Sufficient valves permit variations in control of each tier without affecting all heating zones, neither overheating or underheating at any point in the system is necessary. This has been found to save considerably on fuel.

New apartment house erected in Evanston, Ill., is heated by a hot water system.

ELECTROSTATIC EFFECTS IN FIBER FILTERS FOR AEROSOLS

A.T. Rossano, Jr.
and
Leslie Silverman

HEATING AND VENTILATING'S REFERENCE SECTION

Electrostatic Effects in Fiber Filters for Aerosols

A. T. ROSSANO, JR.* AND LESLIE SILVERMAN†

A discussion of fibrous filters in which aerosol removal is accomplished by electrostatic forces occurring naturally within the fibrous mass.

IN THE theory of filtration through aerosol filters it is recognized that electrostatic forces may represent a significant removal factor. Unfortunately, comparatively little attention has been given to investigation of this factor, hence there is little basic information on this phenomenon.

Much of the current knowledge on electrostatically charged filters is related to the resin-wool filter, a European research development studied in some detail at the Chemical Defense Center at Porton, England.

By electrostatically charged filters is meant those fibrous filters in which aerosol removal is largely accomplished by electrostatic forces occurring naturally within the fibrous mass. This is in contrast to electrostatic precipitators or variations of them in which separation is accomplished by electrostatic forces produced by external electrical apparatus.

Producing Static Electrification

The production of static electricity involves a complex series of phenomena. In spite of the fact that it is the oldest form of electricity known to man, and that there are various known empirical processes for its production, the causes of static electrification are still clouded in a series of obscure and confusing facts.

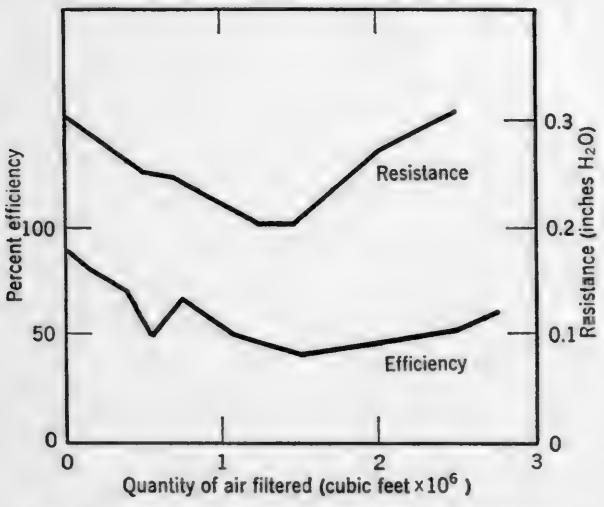

Fig. 1. Performance of resin wool felt (after Billington).

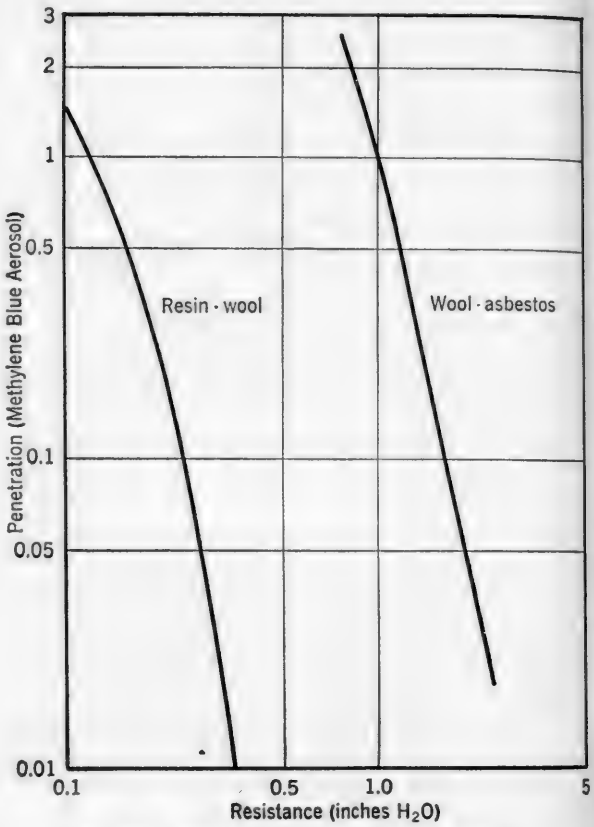

Fig. 2. Resistance-penetration characteristics.

The principal mechanisms of static electrification pertinent to this discussion are:

(1) *Inductive Charging.* Charge induced on a solid in the vicinity of a charged body.

(2) *Field (corona) Charging.* Adsorption of ions on particles moving in an electric field.

(3) *Spray Electrification.* Charging of liquid droplets as a result of atomization or bubbling.

(4) *Frictional or Tribo-electric Charging.* Charging of dry non-metallic surfaces as a result of impact or contact followed by separation.

Mechanisms of Charge Reduction

Electrostatic charge can be dissipated in several ways.

(1) *Grounding.* Direct leakage to ground by means of solid conductors such as metallic strips or wires.

(2) *Humidification.* In atmospheres high in humidity, a thin film of water vapor collects on solid surfaces.

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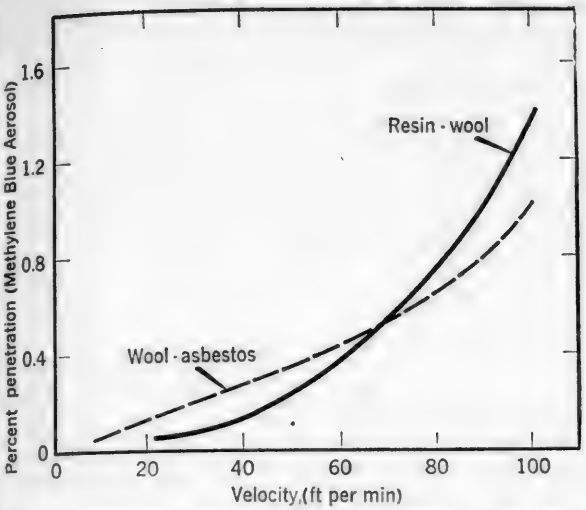


Fig. 3. Penetration vs velocity for wool-asbestos and resin wool.

Although pure water is not a good conductor, water in equilibrium with the atmosphere contains CO_2; this plus the impurities normally existing on solid surfaces provides a conducting film, whereby the charge on the object can leak to ground.

(3) *Chemical Agents.* These represent a large class of antistatic compounds which are applied on surfaces where undesirable or dangerous levels of charge may accumulate.

(4) *Charge Neutralization by Ionization.* This includes various methods whereby ions, purposely generated in the vicinity of the charged body, are attracted to the body and neutralize its charge. These ions can be produced in several ways such as thermal and electrical means as well as ionizing radiations.

Resin-wool Filters

Interest in electrostatically charged filters dates back to 1930 when N. L. Hansen(1)*, a Danish engineer, began his experiments with resin wool filters. He was able to transform a permeable wool pad into a highly efficient filter by the addition of resin powder without any appreciable effect on flow resistance.

Subsequent research conducted mainly at Portion(2) has led to the conclusion that the high removal efficiency is due to the electrostatic attractive forces existing in the field between the positively charged wool fiber and the negatively charged resin particles. This charge is acquired by friction created during the manufacturing process.

The long life of these filters is attributed to the long retention of the charge on the resin which has extremely high electrical resistivity. Breakdown of the filter is caused by oil mist, carbon smoke and ionizing radiations which serve to dissipate the resin charge. High efficiency can be restored by carding which recharges the resin by tribo-electrification.

Recent work on resin-wool done by Billington(3), as shown in Fig. 1, indicates a gradual drop in efficiency with use, followed by a gradual increase. The air flow resistance varies in a similar manner. Thus, it may be reasoned that the initial high efficiency is in part due to the electrostatic charge. As this effect is diminished by gradual loss of charge, efficiency drops until plugging comes into play and efficiency begins to increase by the mechanical action of plugging as is the case in ordinary fiber filters.

Thomas(4) recently presented results comparing a resin-wool filter with an asbestos-wool filter (which exhibits no electrostatic effects). His data, shown in Fig. 2, indicate that for equal penetrations, the resistance of resin-wool is consistently lower than that of asbestos-wool.

Also shown in his data are the penetration-velocity characteristics, Fig. 3, of resin-wool and asbestos-wool of 3.8 lb per cu ft. In both filters penetration increases with velocity. It is seen that below 70 fpm the penetration of resin-wool is lower than that of asbestos-wool. At higher velocities the reverse is true.

As further evidence of the fact that improved performance of resin-wool is due to electrostatic forces, a resin-wool filter impregnated with Beckacite (a para-tertiary butyl phenol-formaldehyde modified resin) was exposed to dosages of X-rays(2). As can be seen from Fig. 4, the penetration of methylene blue aerosol increased in proportion to the degree of exposure. It may be concluded that the ionizing radiations caused diminution of charge on the filter, reduction of electrostatic forces and consequent decrease in filtering efficiency.

Tests performed by Thomas(4), in which the passage of tricresyl phosphate smoke through the filter caused a progressive lowering of efficiency, also confirmed these results. The liquid aerosol was able to wet the fibers causing the charge to leak off (somewhat the same effect

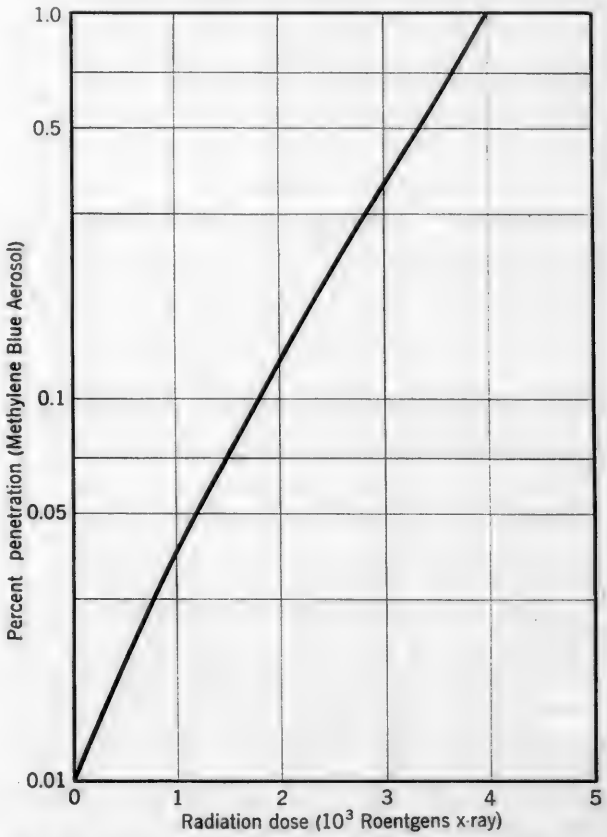


Fig. 4. Effect of radiation on performance of resin wool filter.

*Numbers in parenthesis, unless otherwise indicated, refer to references at the end of the article.

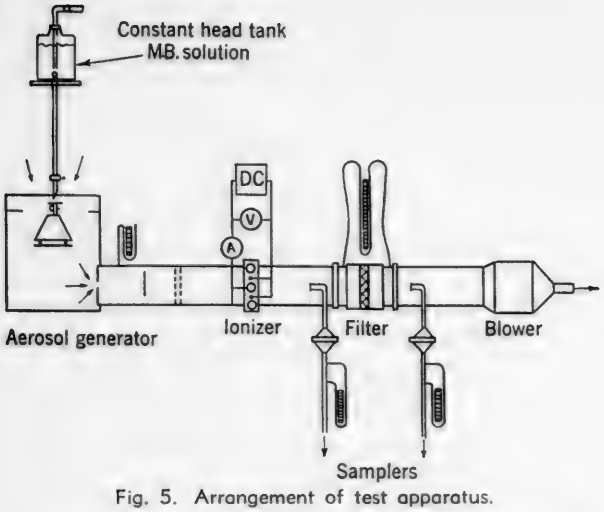


Fig. 5. Arrangement of test apparatus.

of radiation) thus eliminating the beneficial electrostatic forces.

Although initial penetration through a resin-wool filter is low because of electrostatic effects, subsequent low penetration is achieved at the expense of increasing resistance due to plugging. Thus, in industrial applications, where the dust loading is relatively high, the resistance increase with time may be so rapid as to seriously shorten the effective life of the filter.

AEROSOL CHARGE ON FILTER EFFICIENCY

Apparatus and Procedure

The electrical mechanism of removal in a dry fibrous filter is related to the electrostatic force between the aerosol and the collecting surface. This force may be either a coulomb or a polarization force(5). The coulomb force F_c exerted on an aerosol particle possessing a charge Q_p in an electric field of intensity E surrounding a charged fiber is as follows:*

$$F_c = Q_p E$$

The field E at a distance r from the axis of a long slender fiber charged uniformly with Q_f units of charge per centimeter of length is as follows:

$$E = \frac{2Q_f}{kr}$$

Since the relative dielectric constant k for air is nearly 1, the coulomb force experienced by the aerosol particle in air is:

$$F_c = \frac{2Q_p Q_f}{r}$$

Thus, the removal force is a function of the product of the charge on the individual particle and the charge on the fiber.

If F_c is negative, the particles tend to move from the aerosol stream onto the collecting surface, the net effect being an increase in filtering efficiency. Conversely, a positive value would therefore indicate a lowering of efficiency.

In the case where one of the components is charged and the other is a dielectric, the force between the two may be a polarization force(6). An uncharged particle whose dielectric constant differs from that of the surrounding medium experiences a net force when placed in a non-uniform electric field.

Consider an uncharged particle in the non-uniform field E surrounding a long slender charged fiber in air. The inductive force on a particle of volume V and of dielectric constant k is as follows:

$$F_p = \frac{(k-1)VE}{4\pi} \frac{\delta E}{\delta r}$$

where r is the radial distance from the fiber.

Thus, the collecting force on a dielectric particle is related to the absolute value of the electric field surrounding the charged fiber, as well as the field gradient. The motion of the particle will be in the direction of the greatest field strength, that is, towards the fiber, regardless of the polarity of the fiber.

$$\text{Since } E = \frac{2Q_f}{r} \text{ and } \frac{\delta E}{\delta r} = -\frac{2Q_f}{r^2}$$

and the particle volume $V = \pi d^3/6$

then by substitution, there results

$$F_p = -\left(\frac{k-1}{4\pi}\right)\left(\frac{\pi d^3}{6}\right)\left(\frac{2Q_f}{r}\right)\left(\frac{2Q_f}{r^2}\right) = -\frac{(k-1)\ d^3Q_f^2}{6r^3}$$

An evaluation, therefore, of the role of electrostatics in filtration must concern itself with two components—particle charge and fiber charge.

In this study we have divided our investigations into two phases. The first phase is concerned with the effects of particle charge on the filtration efficiency of an initially uncharged fiber filter. The remainder of this article deals principally with this aspect and will include a description of the test procedure, apparatus and results.

The second phase is concerned with the effect of charged fibers on the efficiency of filtration of uncharged aerosol particles. Some exploratory work on this aspect has been initiated, and brief mention will be made of tests in progress.

Aerosol Generator. Fig. 5 shows the general layout of the entire test assembly. A 15-inch diameter steel drum open at the top houses a constant speed motor driving a horizontal 4-inch diameter brass disc. The aerosol was generated by a spinning disc sprayer adapted from the unit developed by Walton & Prewett(7). From an over-

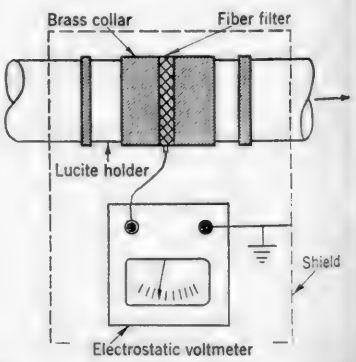


Fig. 6. Aerosol charge measurement unit.

*The units used are in the "unrationalized" cgs or Gaussian system. That is, F is in dynes, E in statvolts per cm, Q in statcoulombs, and r in centimeters.

head constant head tank, a solution of 0.1 percent methylene blue in 95 percent ethyl alcohol is fed through a hypodermic needle onto the center of the disc. The resulting thin liquid film is centrifuged off the edge to form a fine liquid spray consisting of droplets of two distinct sizes; the main droplets and the satellites, of approximately ⅓ the size of the main ones. The diameter of the main droplets is a function of the rotational speed, radius of the disc and physical characteristics of the liquid. An induced downward flow of air through the drum intercepts the satellites and conveys them into the inlet of the 5¼-inch test duct. Contact with dry room air results in the evaporation of ethanol from these droplets and solid spheres of methylene blue are formed. Particle size distribution, determined by means of a Cascade Impactor having a molecular filter (MF or Millipore Filter) as the fifth stage, showed the aerosol to have a mass median diameter of 2.0 microns or (μ) and a geometric standard deviation of 1.3. Loadings could be varied from about 0.1 to 1.7 mg per cubic feet meter with good reproducibility.

A Stairmand disc and diffuser screen are provided in the duct to insure uniform cross-sectional distribution of the aerosol.

Aerosol Charging Device. The aerosol is charged by means of an ionizer section containing a series of electrodes consisting of fine wires and coplanar brass cylinders. A direct current power supply furnishes controlled voltages up to 12,000 volts and ion currents up to 150 microamperes. A unipolar corona discharge is established between the wire and cylinder electrodes. Particles entering the electric field between the wire and cylinder are charged as a result of bombardment of ions having the same polarity as the wire. The emerging aerosol, therefore, possesses a charge having predominantly the same polarity as the discharge electrode. Aerosol charge could be varied from test to test by varying the ionizing voltage and current.

Sampling. Sampling probes placed on either side of the test filter permit determination of filtration efficiency. The filter medium in the sampler is a MF (Hydrosol Assay Type) having an efficiency of approximately 100 percent. The sampling rate was 5 liters per minute.

Mass concentration of methylene blue aerosol collected by the samplers is determined by dissolving the molecular

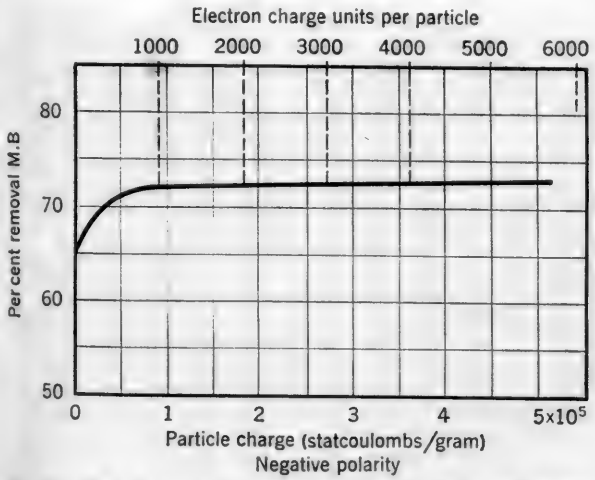


Fig. 7. Effect of particle charge on filtration for a 50 mu glass fiber filter, negative polarity.

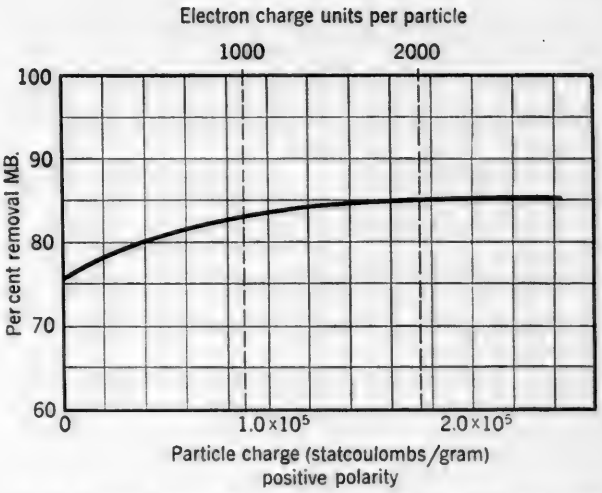


Fig. 8. Effect of particle charge on filtration for a 50 mu glass fiber filter, postive polarity.

filter in acetone, adding ethanol to dissolve the methylene blue and analyzing the solution colorimetrically on a Klett colorimeter.

Aerosol Charge Measurement. The filter medium used in these tests was 50 μ diameter glass fibers packed to a density of one pound per cubic foot. The filter was 5¼ inches in diameter and 1 inch thick. Aerosol charge measurements were made with a Faraday cage consisting of an 8-inch long brass collar around a Lucite filter holder as shown in Fig. 6. A Rawson electrostatic voltmeter of low capacitance and high leakage resistance is connected to the Faraday cylinder. The capacitance of the entire electrical system including the meter is determined by a capacitance meter. Electrical shielding of the measurement unit eliminates the effects of stray electric fields and capacitance. Critical parts of the test assembly are carefully grounded through conductors using soldered connections.

The product of the capacitance of a body and its potential equals its charge. Therefore, the collection of aerosol particles on the test filter is reflected by a steady change in voltage reading. Thus $dQ/dt = C\ dV/dt$, that is, the product of the cylinder voltage change and the capacitance of the system is a measure of the net charge of collected aerosol per unit of time. In this formula, Q is in statcoulombs, C in statfarads and V in statvolts. Appropriate corrections are made for the charge carried by air ions, atmospheric dust and alcohol vapor.

Knowing the aerosol concentration upstream of the filter, as determined by the upstream sampler, it is possible to calculate the weight of mythylene blue collected on the filter after correcting for measured filter efficiency.

From these data the ratio of charge to mass in terms of statcoulombs per gram can be calculated. Since the median particle size is known, a reasonably accurate approximation of the average electron charge units per particle can be obtained.

Test Results. Two series of runs were made, one with positively charged particles and the other with negatively charged particles. The superficial filtering velocity was 33 fpm with a filter resistance of 0.024 inches w.g. Aerosol loading ranged from 0.10 to 0.65 mg per cubic meter for negative aerosol tests, and 0.19 to 1.7 mg per cubic meter for positive aerosol tests. Although the filter used

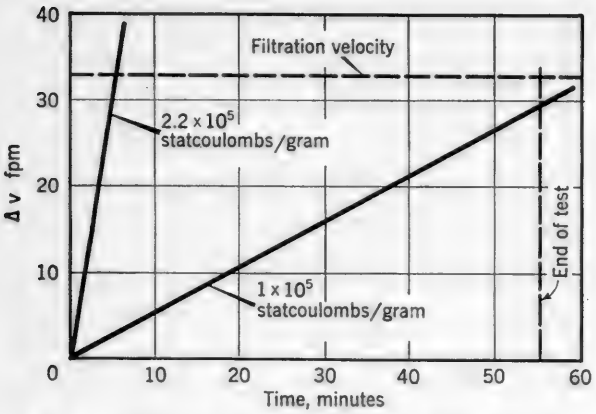


Fig. 9. Retardation of charged particles during filtration.

for the negative aerosol was a different one from that used with the positive aerosol, the medium, packing density, filtration velocity and also the resistance were quite similar.

It will be noted that the filter efficiency at zero charge was different for the two filters. This is of little significance since these tests were concerned only with the relative effect of aerosol charge on penetration.

The shape of the curves in Figs. 7 and 8 indicate that the filter efficiency gradually increases with aerosol charge from an initial value at zero charge to a maximum value, remaining constant with increasing aerosol charge. The results are similar in the case of the positive and negative aerosols. The improvement in collection is a function of the polarization force existing between the charged particles and the uncharged dielectric fibers. This force is similar to that existing in the previously described case of the dielectric particles in the vicinity of charged fibers.

The maximum increase in per cent removal due to charge in either case is the same, namely $\left(\frac{72.5-64.5}{64.5}\right)100 = 12.4$ percent for the negative aerosol, Fig. 7, and $\left(\frac{85-75.5}{74.5}\right)100 = 12.7$ percent for the positive aerosol, Fig. 8. Also noteworthy is the fact that, with either polarity, the maximum efficiency is reached at an aerosol charge of about 2×10^5 statcoulombs per gram of either polarity.

Test results can be explained as follows: The initial or "zero charge" penetration through the filter is determined by its inherent mechanical filtration efficiency. As filtration time increases, the deposition of charged particles on the filter gradually causes it to become charged. As this filter charge increases, the electric field at the filter surface becomes more intense. Thus, approaching charged particles experience an increasing coulomb repulsion until the electric field is sufficiently high to retard or repel oncoming particles.

For the purpose of this discussion let us assume that the filter surface represents a uniformly charged infinite plane. This, admittedly is an over-simplification of the field conditions, but nevertheless it is a limiting case(8). Then:

$$E = \frac{2\pi\delta}{k}$$

where E = electric field intensity
δ = electric charge density at filter surface
k = dielectric constant = 1 for air.

Since the repulsive force F_e on an approaching particle with a charge of Q_p is as follows:

$$F_e = EQ_p,$$

then $F_e = \frac{2\pi\delta Q_p}{k}$ but $\delta = \frac{\triangle Q \cdot t}{A}$

where $\triangle Q$ is the filter charge increment per unit of time, and A is face area of filter.

Therefore $F_e = \frac{2\pi \triangle Q \cdot t \cdot Q_p}{Ak}$

This electrical repulsion causes the particles to decelerate. However, as the particles slow down the viscous drag force of the airstream on the particle increases as follows:

$$F_d = 3\pi\, \mu d \triangle V$$

where F_d = drag force
μ = viscosity of air
d = particle diameter
$\triangle V$ = velocity of particle relative to the airstream.

Since $F_e = F_d = 3\pi\mu d\triangle V$,

$$\triangle V(\text{fpm}) = (2.6 \times 10^5)\triangle Q t Q_p$$

Values of $\triangle V$ during filtration of positive aerosols of relatively low and high charge respectively were calculated and plotted in Fig. 9. It will be noted that the repelling effect of the filter, as it gradually becomes charged by virtue of deposited charged particles, is of significant magnitude. This reduction of particle velocity reduces filter penetration since it increases the effectiveness of such removal factors as gravitational, diffusional and electrostatic forces normally operating in mechanical filtration. The repelling effect in the case of the more highly charged aerosol is much more marked.

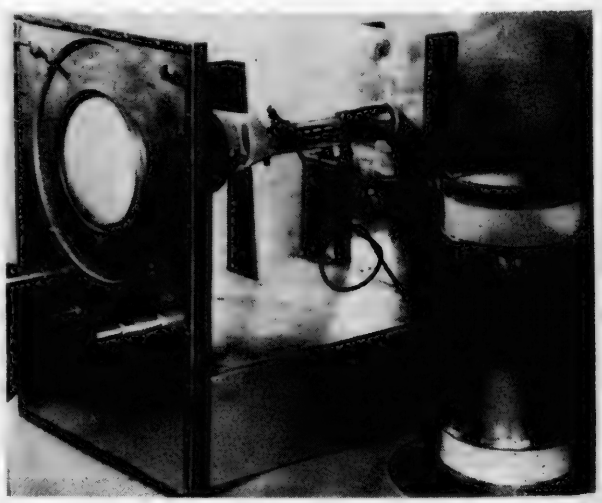


Fig. 10. Oscilloscope for measuring polarity of fiber charge.

From a comparison of the slopes of the two curves it may be inferred that at aerosol charge values slightly higher than 2.2×10^5 statcoulombs per gram, the repulsion effect of the filter reaches a maximum. It follows therefore, that beyond this point filter efficiency assumes a constant maximum value. This is in general agreement with experimental results shown in Fig. 8 which indicate that percent removal of aerosol reaches a maximum at an aerosol charge of about 2×10^5 statcoulombs per gram.

The above explanation is based on the assumption that the filter represents a uniformly charged infinite plane. The actual shape and intensity of the electric field at the surface of the test filter is more complex than this. The actual charge density at the filter face is lower than assumed, and therefore the electrostatic effects are less marked. Nevertheless, these figures serve to demonstrate the general character of these effects and how they vary with aerosol charge.

The failure of the filter to attain a removal value closer to 100 percent may be attributed to the fact that the test aerosol was not completely homogeneous in size and uniformly charged, consequently, there existed particles possessing a charge below the critical value.

EFFECT OF FIBER CHARGE ON FILTER PENETRATION

As mentioned previously, the electrostatic mechanism in filtration involves two components—the particle charge and the fiber charge. The particle charge was discussed previously, however, the fiber charge effects may be of equal or greater importance.

The attraction of airborne dust and line to synthetic fibers and fabrics during textile processing operations suggests the use of these media in aerosol filters. The new synthetic fibers are known to develop and retain high static charges, and this aerosol collection ability is related to electrostatic forces.

Since the new plastic fibers offer the opportunity to study the significance of fiber charge in aerosol removal,

Fig. 11. Apparatus for measuring fiber charge.

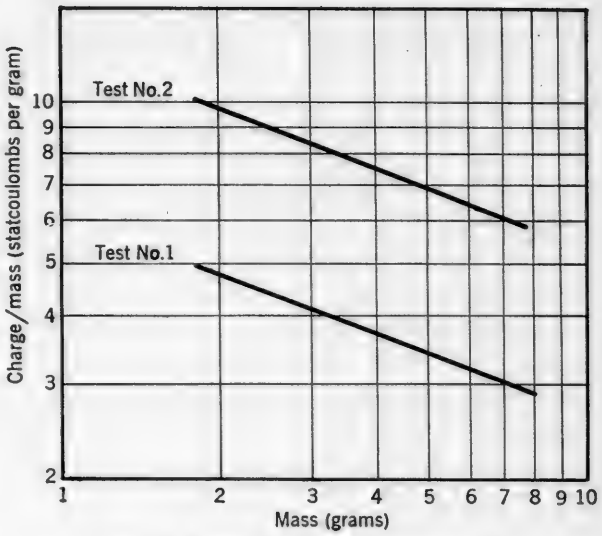


Fig. 12. Results of tests with saran fibers.

we have initiated a program for testing such synthetic fibers as saran, polystyrene, polyethylene, nylon, Dacron, Orlon, Dynel, and Vinyon. To date, our activities have been concerned with a study of the charging characteristics of these fibers and the development of techniques for measuring fiber charge. The principal mechanism for charging synthetic fibers is frictional or tribo-electrification. In general, the intensity and polarity of the charge depends on the nature of the two materials in contact. In order to determine the electrostatic behavior of the various types of fibers, each material in turn was tested against the others and the results compiled into a tribo-electric series.

The apparatus, shown in Fig. 10, for making these determinations involves a Cathode ray oscilloscope having a direct connection to a beam deflection plate. The upper vertical deflection plate is connected to the Faraday cylinder already described. With no sample in the cylinder a spot of light appears in the center of the screen. The two test samples are rubbed together and one of them dropped into the cylinder. If the spot moves downward, the specimen possesses a negative charge, since it causes a repulsion of the electron beam. Conversely, a positively charged sample produces an upward deflection of the Cathode ray.

The results are shown in Table 1.

In this series any material is positive to the one below

TABLE 1—TRIBO-ELECTRIC SERIES OF SEVERAL FIBERS

Positive End
Glass
Wool
Cotton
Nylon
Dacron
Orlon
Polyethylene
Polystyrene
Dynel
Saran
Vinyon
Negative End

it. It will be noted that generally the synthetic fibers are at the negative end.

The method used for measuring the magnitude of the charge generated on the fibers shown in Fig. 11 also involves the Faraday effect. The Faraday cylinder is connected to the Rawson electrostatic voltmeter with a calibrated air capacitor as a range extender. A known weight of fibers is charged by rubbing and dropped into the cylinder. Knowing the capacitance of the system, the net charge is calculated in terms of statcoulombs per gram.

Fig. 12 gives the results of two tests made with 70 μ saran fibers. In Test No. 1 the fibers were hand rubbed, whereas in the second test the charge was generated by rolling the fiber mass in a glass cylinder.

It will be noted that charge decreases exponentially with weight. Plotted on log-log paper, the average slope of these curves is -0.38. Analysis of these data disclosed that these results are in close agreement with the theoretical relationship between mass and the ratio of charge to mass for a sphere having a uniform charge density on its surface. A similar plot of this relationship would yield a line with a slope of -0.33.

These results represent experimental verification of the fact that in charging fibers in this manner, essentially the net charge is distributed on the outer surface of the fiber wad, since tribo-electrification can occur only at the contact surface between the wad and the hand or glass cylinder.

Various methods for placing a charge uniformly distributed throughout the fibrous mass are currently under investigation.

References

(1) Davies, C. N., Fibrous Filters for Dust and Smoke, *The Ninth International Congress in Industrial Medicine.* London, September, 1948.

(2) Walton, W. H., The Electrical Characteristics of Resin Impregnated Filters, Chemical Defense Experimental Station, Porton, England, December, 1942.

(3) Billington, N. W., and Saunders, D. W., Sic Filtration, *Journal of the Institution of Heating and Ventilating Engineers,* Vol. XV, 1947, p. 46.

(4) Thomas, D. J., Fibrous Filters for Fine Particle Filtration, *Journal of the Institution of Heating and Ventilating Engineers,* Vol. XX, May, 1952, p. 35.

(5) Ranz, N. E. and Wong, J. B., Impaction of Dust and Smoke Particles, *Industrial and Engineering Chemistry,* Vol. 44, June, 1952, p. 1371.

(6) Pohl, H. A., The Motion and Precipitation of Suspensoids in Divergent Electric Fields, *Journal of Applied Physics,* Vol. 22, July, 1951.

(7) Walton, W. H. and Prewett, W. C., Production of Sprays and Mists of Uniform Drop Size by Means of Spinning Disc Type Sprayers, *Proc. Phys. Soc.* (London) 62B:341 (1949).

(8) Gilbert, N. E., Electricity and Magnetism, MacMillam Company, New York, 1941.

Plant Features Cold Control

As a result of an expansion program completed recently, the dairy products plant of L. S. Heath & Sons, Inc., of Robinson, Illinois, is now one of the most modern in the nation, according to the opinion of company officials.

The program, begun a year ago, included the addition of an $82,000 building to the dairy plant, a garage and maintenance shop 100 by 65 ft, and added warehouse and storage space for the company's candy manufacturing operations.

L. S. Heath & Sons, founded in 1914, employs 350 persons, and processes milk and other dairy products; bottles soft drinks and manufactures ice cream and the Heath English Toffee candy bar.

The new building, 84 by 72 ft, houses the company's Grade A operations and contains the latest and most scientific equipment for homogenizing and pasteurizing milk. Two machines for bottling half gallon and quart containers of milk are located in the new addition for this plant.

A new cold storage room, 48 by 24 ft, literally wrapped in Fiberglas insulation was built in the addition to assist in maintaining a uniform temperature of 38F for all dairy products.

Ice Making Equipment

New ice making equipment was installed to manufacture 30,000 pounds of ice every eight hours. The ice is used to chill water which is circulated throughout the plant to instantly cool the finished dairy products to a temperature of 38 degrees. The chilled water also supplies refrigeration for the ice cream, cheese and soft drink bottling plants.

A modern ventilating system provides for a complete change of filtered air each four minutes. Natural light enters the building through glass block which diffuses and distributes the light evenly throughout the several rooms.

Loading facilities have been increased by enlargement of the dock space so that 12 or more milk delivery trucks can be loaded at one time. A second floor above the cold storage room provides space for storing two carloads of paper milk cartons. Boxes of the blank cartons are fed to the bottling machines by a gravity chute. This room is air conditioned and de-humidified.

The milk processing rooms are constructed of ceramic-glazed tile in green and cream tile with black trim. The floors are of sun-tan colored tile and incombustible Fiberglas acoustical ceiling board has been installed in ceiling areas on a suspended aluminum grid system. The ceiling board which has a high thermal efficiency and reduces noise, has a plastic facing for ease of maintenance.

Fiberglas form boards were used to provide a lightweight, incombustible roof deck. Five offices are included in the new addition with partitons of glass block and birch wood paneling.

Refrigeration equipment used is a York air blower, and air conditioning for the offices is Frigidaire equipment. The ice builder is a Creamery Package Co., unit.

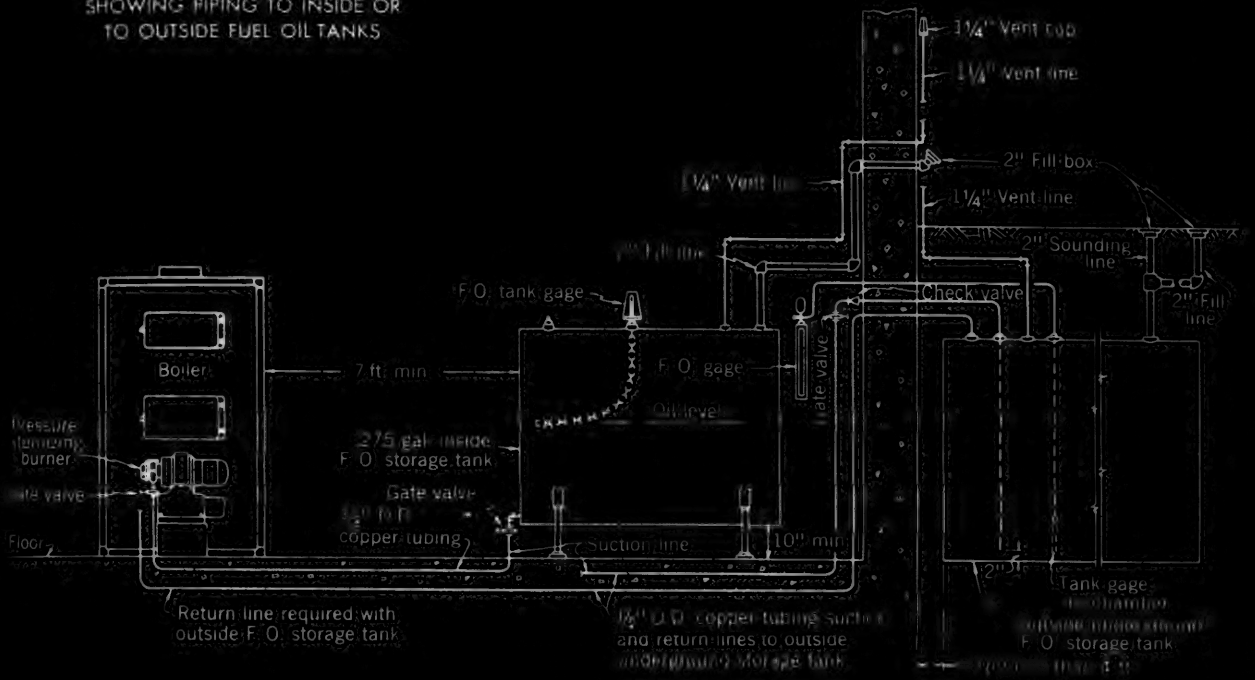
Four inch thicknesses of Fiberglas asphalt-enclosed board is contained in the walls of the cold storage room and four inch thicknesses of Fiberglas asphalt-enclosed floor board was installed in floor areas.

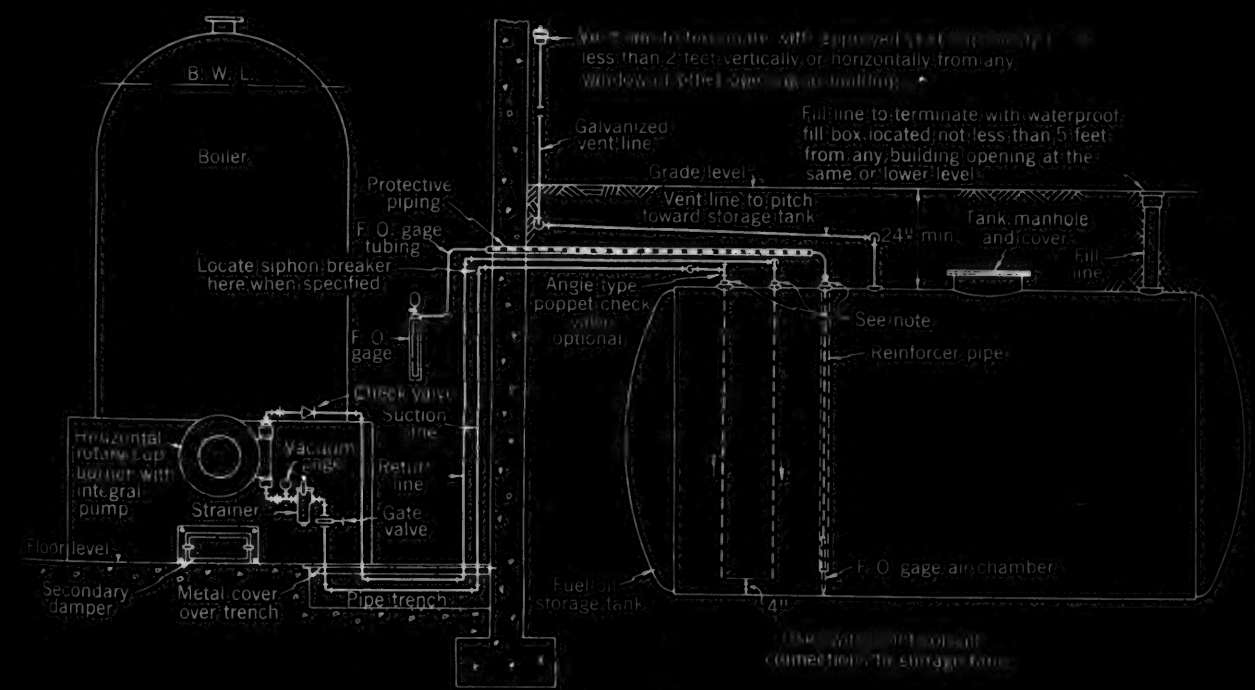
Exterior of the one floor addition is of buff brick with stone trim. Black vitrolite glass is used to face the space between window openings.

Smith, Kratz and Strong of Urbana, Illinois was the architect and W. J. Schernekau of Robinson, Illinois was the general contractor. Dairy engineers from St. Louis assisted with the design and equipment layout. The Fiberglas products are manufactured by Owens-Corning Fiberglas Corporation of Toledo.

PIPING FOR FUEL OIL BURNERS

TYPICAL DOMESTIC INSTALLATION SHOWING PIPING TO INSIDE OR TO OUTSIDE FUEL OIL TANKS

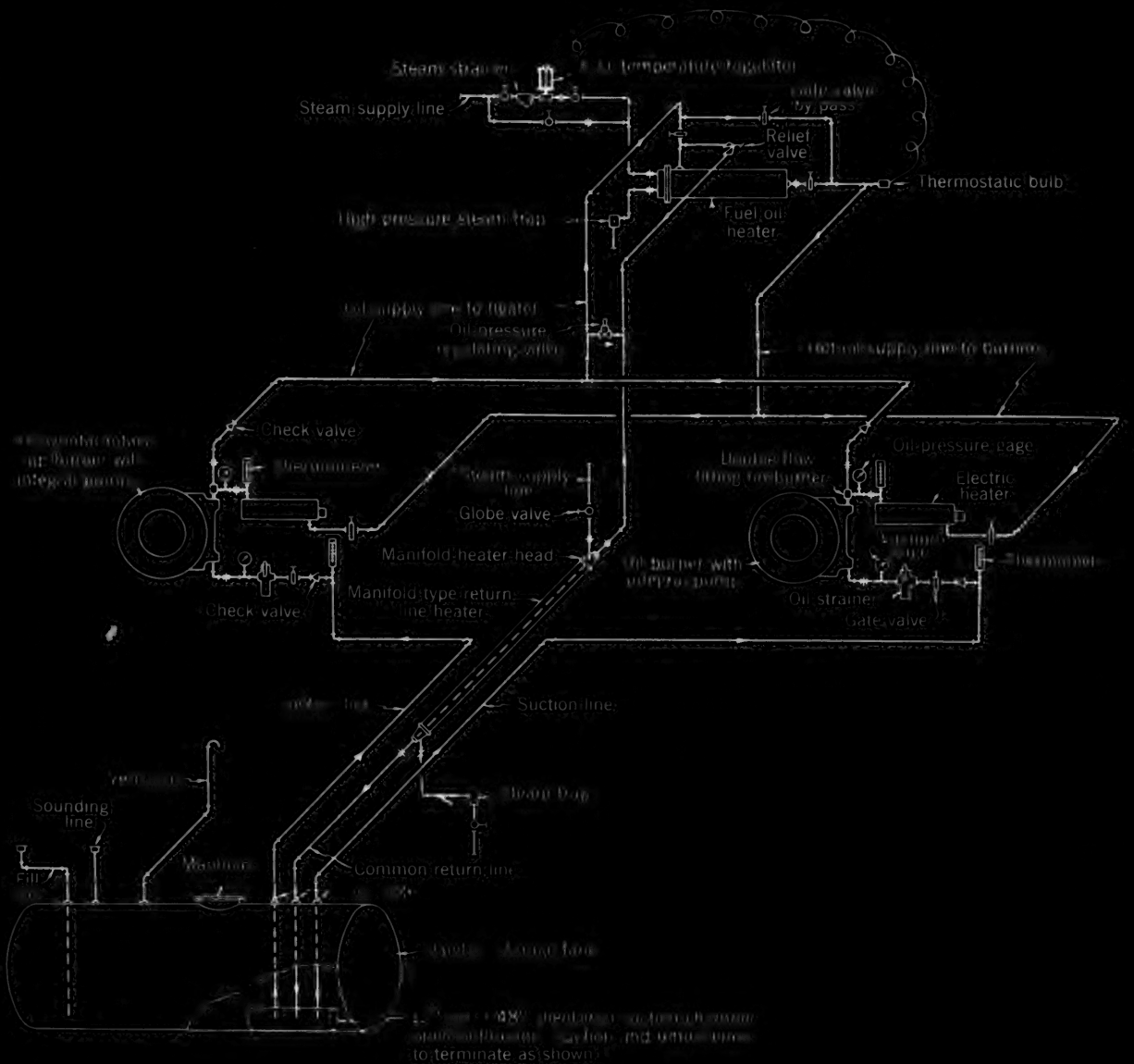




PIPING FOR A COMMERCIAL INSTALLATION BURNING NO. 5 OR LIGHTER OIL NOT REQUIRING PREHEATING OF OIL

HEATING AND VENTILATING 5 DETAIL SHEET

PIPING FOR FUEL OIL BURNERS



PIPING FOR A TYPICAL MULTIPLE BURNER INSTALLATION

NOTE As indicated on drawings, suction stub is welded to a bushing that is threaded on the outside

Effect of High Design Water Temperatures on Seasonal Fuel Consumption

WARREN S. HARRIS

Research Professor of Mechanical Engineering, University of Illinois, Urbana, Ill.

Everyone agrees that the higher the design water temperature in hot water heating systems, the smaller the amount of radiation required and the lower the installed cost, but many heating engineers and contractors are of the opinion that the higher the design water temperature, the higher will be the seasonal cost of operation. If the boiler were maintained at design temperature throughout the heating season that opinion would be sound. However, tests made in the I-B-R Research Home at Urbana, Illinois, indicate that within reasonable limits, the system design water temperature has only a very small effect on cost of operation.

THE following analysis of a hot water heating system operating at different water design temperatures assumes a control system in which the thermostat controls the operations of both the burner and the circulator, a high limit control in the boiler turns off the burner in the event of excessive water temperatures, and, if domestic water is being supplied by an indirect heater, a low limit control will start the burner but not the circulator whenever the temperature of the water in the boiler is too low for satisfactory operation of the indirect heater.

Figure 1 represents the frequency of occurence of days of different average outdoor temperatures at Urbana during the course of a normal winter. For example, in a normal winter there will be 30 days in which the average outdoor temperature will be between 35 and 40F, and 1.0 days in which the outdoor temperature will be between zero and —5F.

Curve A, Fig. 2, shows the relationship between outdoor temperature and required water temperature in a hot water heating system designed to operate with an average water temperature of 170F in order to maintain an indoor temperature of 70F when the outdoor temperature is —10F. Curve B shows the same relationship for a system designed to operate with an average water temperature of 215F when the outdoor temperature is

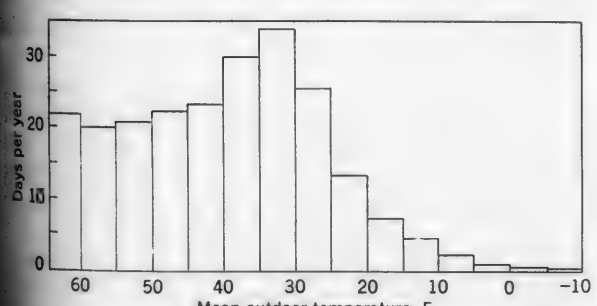


Fig. 1. Number of days per year at various mean outdoor temperatures.

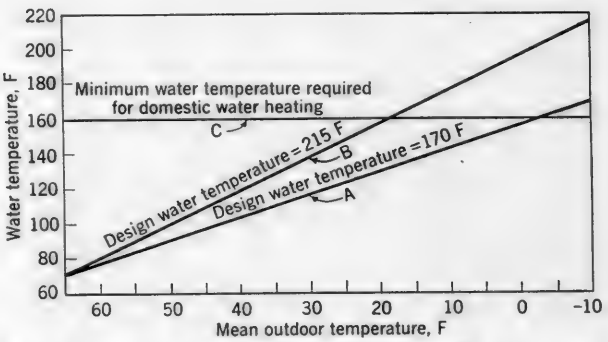


Fig. 2. Water temperatures required to hold 70F indoors while outdoor temperature varies.

—10F. These curves intersect a water temperature of 70F at an outdoor temperature of 65F since experience has shown that no heating is required when the average outdoor temperature is 65F or above. Curve C of Fig. 2 represents the minimum temperature which must be maintained in the boiler if an indirect water heater is used. If the boiler is used both to supply heat for the house and for domestic water heating, it is necessary to provide a low limit control which will operate the burner to maintain the minimum water temperature required for domestic water heating. Some applications demand that the temperature be higher than the 160F indicated by Curve C, but temperatures lower than 160F are seldom encountered.

The difference between values read from Curves A and B in Fig. 2 at any given outdoor temperature represent the increase in required water temperature resulting from the use of a design water temperature of 215F as compared with 170F. The increase in water temperature over the whole range of outdoor temperatures is shown by Curve abc in Fig. 3.

If the boiler is to be used for domestic water heating as well as house heating, the boiler water temperature must not drop below 160F regardless of design conditions. Line adbc, Fig. 3, shows the difference in water temperature for systems designed for water temperatures

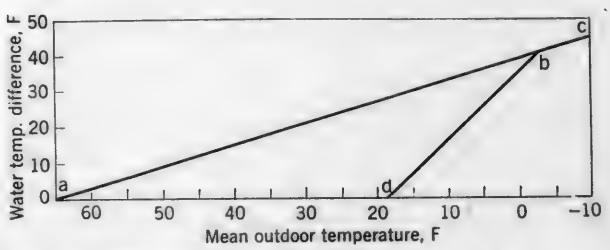


Fig. 3. Differences between water temperatures at various outdoor temperatures for systems designed at 170F and 215F water temperatures.

TABLE 1.—FUEL CONSUMPTION USING 170F and 215F DESIGN WATER TEMPERATURES

(1)	(2)	(3)	(4)	(5)	(6)
Avg. Outdoor Temp., F	Avg. No. Days per Year	Heating and Service Water[1]	Heating Water Only[2]	Based on Col. 3[3]	Based on Col. 4[4]
		Increase in Water Temperature, F		Increase in Fuel Oil Consumption, lb	
—10 to —5	0.2	43	43	0.78	0.50
— 5 to 0	0.4	40	40	1.46	0.93
0 to 5	0.8	31	37	2.26	1.72
5 to 10	2.2	21	34	4.20	4.34
10 to 15	4.6	12	31	5.02	8.27
15 to 20	7.6	2	28	1.38	12.34
20 to 25	13.6	0	25	0.00	19.72
25 to 30	25.4		22		32.41
30 to 35	33.8		19		37.25
35 to 40	30.0		16		27.84
40 to 45	23.4		13		17.64
45 to 50	22.6		10		13.11
50 to 55	20.8		7		8.45
55 to 60	19.8		4		4.59
60 to 65	22.0		2		2.55
65 to 70	19.0		0		0.00
			Totals	2.16 gal	27.38 gal
				15.10 lb	191.66 lb

(Based on records of U. S. Weather Bureau Station at the University of Illinois and test data from the Research Home. Includes months of January, February, March, April, May, September, October, November, and December, from September 1936, to May 1941.)

[1]Curve adbc, Fig. 3.

[2]Curve abc, Fig. 3.

[3]House heating and domestic water heating using indirect storage water heater connected to 30 gal. water storage tank. Increase in daily oil consumption = 0.091 lb per degree F increase in boiler water temperature. Values in Col. 5 = 0.091 × (Col. 3) × (Col. 2).

[4]House heating only. Increase in daily oil consumption = 0.058 lb per degree F increase in boiler water temperature. Values in Col. 6 = 0.058 × (Col. 4) × (Col. 2).

of 215F and 170F if the systems are operated to supply domestic hot water as well as to heat the house.

Any increase in operating cost resulting from the use of high design water temperatures must result from higher losses from the boiler due to the higher average water temperatures maintained.

Figures 1, 2, and 3 show that if the boiler is used to supply domestic hot water as well as to heat the house, increasing the design water temperature from 170F to 215F will not affect the temperature of the boiler water maintained over about 90% of the winter. Therefore, the effect of the increase of design water temperature on cost of operation is negligible. Even if the boiler is not used to supply domestic hot water, the increase in the boiler water temperatures over most of the heating season will be less than 50% of the increase in the design water temperature.

The effect of design water temperature on fuel consumption can be illustrated in another way using data obtained on an oil-fired hot water system operating in the I-B-R Research Home. Operating data on this system, which have been published in University of Illinois Engineering Experiment Station Bulletin No. 366 "Performance of an Indirect Storage Type of Hot-Water Heater", show that, for the system used for house heating only, increasing the design boiler water temperature from 170F to 215F increased the daily oil consumption by 2.6 pounds, or 0.058 pounds per degree increase in boiler water temperature. When a storage type water heater connected to a 30 gallon storage tank was attached to the boiler, it was found that increasing the boiler water temperature from 170F to 215F increased the daily oil consumption by 4.1 pounds or 0.091 pounds per degree increase in boiler water temperature.

Using these increases in fuel consumption, as determined by test together with the information given in Figs. 1, 2, and 3, the increase in fuel consumption resulting from the use of 215F design water temperature as compared to a design water temperature of 170F may be estimated as shown in Table 1.

Approximately 850 gallons of oil per year are required to heat the Research Home. Therefore, the fuel consumption for this system designed for house heating only and using a design water temperature of 215F would be about (27/850) x 100 = 3.2% higher than if a design water temperature of 170F were used. If the systems were designed to supply domestic hot water as well as to heat the house, the increase in seasonal fuel consumption would be about 0.25%.

Window Units Installed Flush with Outside Wall

A room air conditioner installation in Havana, Cuba, provides the answer to a widespread problem: How to install a room air conditioner where house rules forbid protrusions past the building line.

Presented with the need for two ¾-ton units in an oculist's office containing only one outer wall, engineers placed the air conditioners one under the other in attractive wooden frames extending through the outer wall and with six-inch interior extensions painted to blend with the interior color scheme.

The remaining portion of the frame is enclosed within the outer wall so that total depth is enough to accommodate the 16¾-inch outer cabinet with enough space left for a decorative wood or metal louvered grille flush with the outside wall.

Installing engineers advised that the following technical points must be considered in this type of installation:

(1) A space of four inches on each side of the outer cabinet is *minimum* to allow for the condenser air inlet to the outer cabinet side louvers.

(2) The outer cabinet must be exactly level or pitched slightly down toward the outside to permit proper condensate removal.

(3) The rainwater drain should be carefully caulked at all joints so that heavy rainfall will not drain toward the room side.

(4) Inside surfaces and insulation should be coated with water-proofing finishes to prevent soaking or warping.

Armand Zucker, director of design and development for the Mitchell Manufacturing Co., said the Havana installation, a Mitchell job, will be used as a model for similar jobs handled by other dealers.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

THE problem discussed in this issue is not an uncommon one. It concerns the practicability of a corrective measure where equipment for a summer air conditioning system proved inadequate and it was necessary to install equipment which would give greater capacity. In this problem, replacement by a larger capacity unit was not feasible because of space limitations and cost, and another solution had to be found.

This department is planned for the plant engineer and should you have a problem that you would like to see treated in this department or if you have some comments that you would like to add to the discussion for next month's problem, you are invited to write to the Editor.

This Month's Problem

A 30-ton evaporative condenser installed adjacent to the compressor on the ground floor of a multi-story building, proved too small for peak summer air conditioning loads. Because of the expense and space limitations, we do not want to replace the present unit with a larger one. We propose to install a shell and tube condenser cooled by city water for the remaining 7 tons required to handle the full load. This would be placed between the evaporative condenser and the receiver. Is this proposed system practical or can this idea be improved? If such an arrangement is not recommended, why?

This Month's Problem

It is quite satisfactory to increase condensing surface by using a small water cooled condenser between the evaporative condenser and the receiver, provided the gas and liquid connections on the condenser are sized for not more than 100 fpm liquid velocity, and both lines are free draining, with no traps anywhere to cause liquid to back up into the condensing surface.

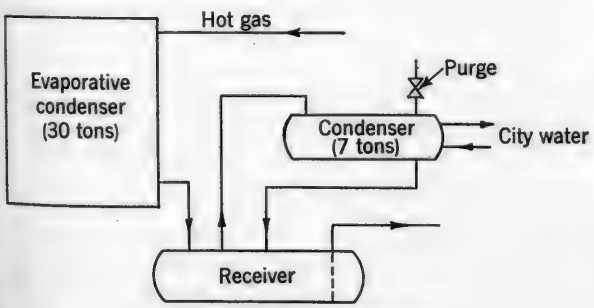


Fig. 1. A solution to the problem

Conducted by
NATHAN N. WOLPERT
Associate Editor

If there is not enough vertical distance between the top of the receiver and the liquid outlet of the evaporative condenser to make both lines free draining, the hookup shown in Fig. 1 may be used. The condenser takes its gas from the top of the receiver and drains its liquid back into the receiver. The performance of the high side will not be affected in any way when the evaporative condenser is operating alone, and during peak loads the water cooled condenser will actually help to keep the evaporative condenser drained.

E. S. Bishop
Industrial Application Eng. Dept.
York Corp.
York, Pa.

The proposed system of installing an auxiliary shell and tube condenser between the evaporative condenser and the liquid receiver, would appear to be very practical. Not only will it take care of the additional load when conditions demand, but it could also serve as a liquid sub-cooler during lighter load conditions.

D. H. McCuaig
Manager, Central Station Equipment Section, Air Conditioning and Refrigeration Division, Worthington Corp.
Holyoke, Mass.

We see no objection to the installation of an accessory water-cooled condenser to make up for the shortage in the existing 30-ton evaporative condenser. We note the proposed arrangement places the water-cooled condenser in the hot gas line between the evaporative condenser and the receiver, and we presume that the evaporative condenser would be controlled by a water regulating valve in the usual manner.

While series arrangement of the water-cooled condenser in the hot gas line would perhaps be satisfactory, we believe that a parallel piping arrangement would result in less pressure drop in the line, and would also avoid

Problem for the Coming Issue

We plan to install a snow melting system for a driveway 50 ft long that leads to a loading platform. A steam supply is available for the heating. What should be the heat output for this system and how should the pipe be installed to provide good operation? How should the steam converter be piped?

possible inefficiencies in heat transfer, owing to excess liquid from the first stage condenser flooding the tubes of the second stage condenser in the series arrangement. The water regulating valve would of course be set for a relatively high pressure, such as 150 psig so that the water-cooled condenser would be activated only when the load required it, and would otherwise not pass any water. The water regulating valve would function satisfactorily with the condenser in the series or in the parallel refrigerant connection.

The parallel arrangement in the hot gas line would definitely require a common liquid receiver, which is evidently contemplated anyway, and we do not believe there would be any serious tendency for bypassing the evaporative condenser when water was not flowing through the water-cooled condenser. It is not believed that there would be any serious hogging of the refrigerant to the water-cooled condenser when it was in use, but this would be somewhat determined by the relative piping resistances in the two condenser circuits. At worst, there would be nothing more required than adding a variable resistance valve in series with the water condenser refrigerant circuit if this is necessary.

Howard A. Blair
Product Manager,
Self-Contained Air Conditioning Equipment,
Westinghouse Electric Corp.
Hyde Park, Mass.

Moisture Determination in a Circulating Refrigerant

A simple, rapid method for determining the water content of a circulating refrigerant of the fluorocarbon group has been developed by A. W. Diniak, E. E. Hughes, and M. Fujii of the National Bureau of Standards. Based on the change in electrical resistance of an electrolytic film as it absorbs water vapor, the method is an application of the electrical conductivity method for determining water vapor in gases, developed and used for many years by E. R. Weaver of NBS. The method is highly sensitive, gives accurate results, and does not require the removal of a sample from the circulation cycle. Determinations can be made repeatedly without difficulty, making it possible not only to determine the water content of the refrigerant, but also to follow and determine continuously its instantaneous water content before and after passage through a drier.

In commercial refrigeration systems, the presence of water in the refrigerant constitutes a serious problem because freezing of the expansion valve and corrosion are always possibilities. Until now there has been no completely satisfactory procedure for determining the moisture content of a circulating refrigerant. Although several good methods for determining the moisture content of refrigerants in static containers are available, none is readily adaptable to a circulating refrigerant, chiefly because they require the removal of large samples, which would upset the steady state of the cycle. Such methods are also time-consuming and require much experience with the method involved. In contrast, the NBS method is very quick, simple, and convenient. Once a sampling and a return point have been placed in the system, the measuring apparatus can be quickly connected and a determination made in 15 or 20 minutes.

A thin film of hygroscopic material—usually a mixture of sulphuric and phosphoric acids—is spread over the surface of a solid insulator between metallic electrodes in a pressure-tight enclosure. The electrolyte tends to reach equilibrium with the water vapor in the surrounding gas and to form a solution whose electrical conductance is a measure of the concentration of water vapor in the gas. This conductance is indicated by a simple electronic circuit and a microammeter.

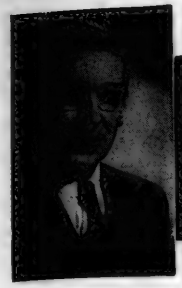
A gas of known moisture content is used to calibrate the film after each reading. By adjusting the pressure of the comparison gas until the same conductivity reading is obtained for both the known and unknown gas, the two gases can be made to have the same water concentration. The unknown water content can then be calculated from the two pressures and the known water content of the comparison gas at atmospheric pressure.

Usually the comparison gas has been saturated at a high pressure (about 1000 psi) and room temperature in a specially designed saturator and then permitted to expand for use. For very dry systems, a secondary comparison gas is employed. This is simply a quantity of fairly dry air whose moisture content has been previously determined by comparison with the saturated air and is therefore known.

Because of the pressure relationships involved and because a liquid would wash away part of the hygroscopic film, the electrical conductivity method can only be used to make moisture determinations of samples in the gaseous state. Thus, in the equipment constructed at NBS, a very small amount of the circulating refrigerant is "detoured" from the system, vaporized by heating, passed through the pressure chamber containing the hygroscopic film, and returned to the suction line for recirculation.

To prevent fractionation which would take place if only a part of the liquid sample were vaporized, it is necessary to withdraw the sample through a capillary tube so that the entire sample may be continuously vaporized. The vaporized refrigerant is then led to the detector block—a specially built, pressure-tight enclosure containing the moisture detecting element. By manipulating three control valves in the detector block, either refrigerant vapor or the comparison gas can be caused to flow past the hygroscopic film. However, the detector block is so constructed that the flow of refrigerant vapor through it is never interrupted; it is merely cut off from the detecting film.

To establish the validity of the electrical method for moisture determinations in a refrigerant, NBS compared results obtained by this method with the results of gravimetric determinations by the phosphorus pentoxide absorption method. Both types of determinations were made on the same or similar samples of refrigerant at the same, or very nearly the same time. No important discrepancy was found between the results obtained by the two methods.



Experience is my Classroom

By T. W. REYNOLDS

• THE WARMING UP LOAD

An interesting book on the use of steam makes some valuable observations. There is one passage, however, that while indicating good original thinking, does not pursue the subject far enough, particularly on the practical side. This passage pertains to the warming up load of a steam main and reads in substance as follows:

"At the start of the warming up period, pressure is lower, therefore the latent heat of the steam is higher and much of the sensible heat in the condensate goes to heat the pipe, both of which reduce the amount of condensate, which, incidentally, also lingers longer. On the other hand, the pipe is losing heat by radiation and convection and this increases the amount of condensate."

Steam has only been used for heating because of its high latent heat. It would be nice if the sensible heat could be made to do its share of the work and do so with fewer pounds of condensate for traps to handle, but condensate continues to be a burden and helps to sell traps.

Now I do not find that in usual heating, the pressure is sufficiently low to give an important increase in latent heat, or that heat losses from the pipe are of moment during the low average temperature difference of short warm up duration. Nor do I find that the condensate can do much heating, even if it were able to contact all of the pipe and linger sufficiently long. This it does not do.

I took the trouble of developing likely conditions and spreading them out as calculations on four sheets of paper. No need, however, to spread the mathematical details out before the reader. Those interested can work it out from the basic conditions given near the end of this article. I will, therefore, be content with the following overall observations, the best I can contribute to a subject having variabilities not too well known.

Condensate can cool somewhat in a cooling or collecting leg, but a steam main, let us hope, is no leg of any kind. Condensate comes back to the boiler reasonably cool in normal operation after quite a lengthy sojourn in cooling radiators and return pipes. But it is well known that steam main drips come back so hot they slow up other condensate. This is especially true during warming up when the condensate is too great to lose much heat, and velocity in the main is highest. As a rule, a steam main has several drips, all relatively large, for passing both condensate and air. The traps open wide when cold, and the pump vacuum even extends to within the steam main at times.

The increase in latent heat in a pound of low pressure steam, as the pressure decreases, is negligible. As for the sensible heat, if it could do any appreciable warming up of the main, it will do so only by using up the latent heat.

Condensate Return

Except where re-evaporation takes place to wet a pipe's interior, the condensate in many observed places comes out of an open return in a trickle the size of a lead pencil. From the calculations made for the assumed conditions, a 3-inch and 8-inch steam main (selected for comparative purposes), will have about 10% of the interior perimeter in contact with the condensate. In the 3-inch main there will be about a 0.1-inch water level and in the 8-inch main about three times as much because of its greater relative steam and condensing capacity. Of course, the condensate can by conduction, warm a slight bit more than its coverage, but a thing like condensate, which is low pressure heating, dwindles from a cubic foot of steam to about a mere cubic inch, and then contains (above 32F) a partially available 16% of the total heat in the steam, isn't too valuable.

Now as to re-evaporation or flash, it never by experience is found large where flash is encouraged, let alone in a main with a ½ psi drop in pressure. If the warming up is very slow and the main very long, some of the condensate may flow along well before the steam and subtract a bit of heat from the condensate by flash. However, with the calculations I made, a 10-inch vacuum extending back into the steam main, showed only 2% flash from the sensible heat to wet the pipe and help warm it up.

Calculations

By calculation, with efficient trapping, the 3-inch main will warm up in four minutes and the 8-inch main in a little over one minute. The 1953 ASHVE *Guide*, p. 491, contains a graph on warming up and states that the warming up load can be as high as 143% of design requirements. This graph shows, for the two-pipe gravity heating system tested, that it takes 10 minutes to raise the pressure to normal operating pressure; maximum condensation is reached in five minutes and is down to normal in twelve minutes; maximum air relief in two minutes. So I do not feel that the calculations I made are too favorable for the assumed vacuum system.

When a steam main is trapped, one is apt to put the same size of drip trap on an 8-inch main as he does on a 3-inch main, and sometimes a small trap might do for either. At other times it will not. Just to show the difference, note in the following text that whatever a 3-inch main has, an 8-inch main also has and by many times more. This part of the discussion is interesting from the standpoint of adequate trapping for different sizes of mains.

(*Concluded on page* 150)

LONDON LETTER

Commentary on developments in Europe by our correspondent in Great Britain

SOONER rather than later, in any attempt to make sense out of reports from other countries, you come bang up against the problem of units. Most of the technical words in a comparatively new technology like Heating and Ventilating are international or readily recognizable, and then the illustrations and the tables tell you most of what you want to know, *if* you know what the figures mean!

One does not have to go to France, Denmark or Italy to find difficulties. The following question was recently put to a representative selection of scientists, milk roundsmen, housewives and petrol (i.e., gas) salesmen: "If, as Americans believe,

A pint's a pound
The world around,

how many pints are there in an American gallon?"

16.7% answered "Ten"
8.3% said "Eight and a bit, I suppose"
8.3% said "Eight"
66.7% "Don't know."

Confusion Worse Confounded

Of course, it was a very confusing question. People here know very well that

A pint of water
Weighs a pound and quarter

Which means that when the visitor from Milwaukee is offered his first half-pint in an English pub he is pleased at the size of it—until he finds it has not been iced. There is, however, a quarrel about the size of a *gill*. In this London neighborhood it is a quarter of a pint. In your correspondent's birthplace near Manchester there are only two gills to a pint of milk.

Gills?

Fortunately such differences are of minor importance, and we can congratulate ourselves on sharing a really *practical* system of units and not becoming slaves of the decimal system. This point of view needs some justifying. It is more usual to deplore that we did not succumb to that system, regretting that it is now too late to change. But a bit more thought shows that our units have evolved gradually through the ages, and therefore deserve to be better than something thought up by planners. They have had a long history, and still retain a few outposts in the decimal desert. In their youth the foot and the yard had to compete with the *hand* (4 inches), the *span* (9 inches), the *cubit* (18 to 20 inches) and the *ell* (45 inches). The *metre's* original claim to recognition was based on its being related to the circumference of the earth. As if that mattered. And it was wrong anyway. It could just as well have been made exactly, say, 40 inches, although if they had tried they would probably have got that wrong too, like the *litre* which has recently had to choose between being a *kilogram* or the weight of a cubic decimeter of water. Alternatively the *kilogramme* might have been made exactly 2 lb, although there is a slight compensation in its chosen value in that a *metric tonne* (2204 lb) is very close to a ton (2240 lb).

It has been claimed that the logical relationships and the factors of ten between the units in the decimal system are an advantage. But this may be illusory. Might not the generally satisfactory showing of the engineers of the English-speaking world be due in part to schoolboy practice with the ft-lb-sec system of units? There are some useful relationships in our system, accurate enough for practical purposes; for example, a cubic foot of water weighs 1000 oz and contains 6¼ (or 7½) gallons, and materials cost the same number of shillings a hundredweight as they do pounds (£) per ton. The short ton of 2000 lb helps to rationalize a ton with cents per pound, but anything resembling praise for a decimal system of money would be out of place here. It would certainly be a convenience to be able to use the same calculating machine for money and ordinary figures, but in defense of the pound (£) let it be noted that it is exactly divisible by 2, 3, 4, 5, 6, 8 & 10, whilst the aristocratic *guinea* is divisible by 7. Furthermore, persons born in this country are usually able to distinguish the two commonest silver coins, *florin* (two shillings) and *half-crown* (two and sixpence), within eight or ten years.

No practice for schoolboys.

The Practical Aspect

There would be a distinct loss if, as many continental engineers would like, we changed over to metric units. The *litre* is too large for milk and too small for gasoline or for the water content of a heating system. The *kilogramme* being too large, the pound *(libbra, livre* or *Pfund)* is still used for groceries and the like all over Europe. Its weight, of course, is 500 g. But the pound is like that—adaptable. Ever since a day during World War II when flour stocks became the British pound, a loaf of bread has weighed only 14 ounces!

European pipe sizes are actually in inches, or the nearest metric equivalent, as was shown recently by a nomogram in a Swiss journal; a series of lines representing different pipe diameters were marked 76.5, 70, 60, 50, 40, 1, ¾, ½, ⅜. These units can only be millimeters from 3 inches to 1 inch, and fractions of an inch below that. With such a large gap between *mm* or *cm* and

metre, where we have the useful inch and foot, one might expect to see more use made of the *dm*, and indeed air velocities in dm/sec are involved in one French formula.

Too large for milk, too small for gasoline.

But with dx/dy and *dl* and *dt* around, *dm* does not *look* like a dimension at all; it is probably afraid of being mistaken for a differential. Since it is almost exactly a *hand*, one might expect to find it used in racing circles. French horses, however, generally reckon their height in metres.

The horse-power is a unit that quite illogically survives in the metric system under various names and abbreviations. *Pferdekraft* is its German disguise, and the Italian is *cavallo vapore*, or CV for short. The unwary might easily mistake this for calorific value, and while on this subject it is worthy of note that the Germans generally express the efficiency of boilers on the net or lower heating value of the fuel, on the reasonable grounds that in practice one cannot condense the water vapour in the flue gases; the British use the gross or higher heating value on the equally reasonable grounds that this is what is actually determined in the laboratory, and one cannot know the net caloric value without determining the hydrogen in the fuel by analysis. The result is that German plants appear to be more efficient than British.

Units of Pressure, Heat and Temperature

The abbreviation *Hp* in a French description of a boiler has nothing whatever to do with horsepower, even boiler horsepower. It is a measure of pressure, the *Hectopieze*. It is very nearly but not quite equal to a metre water gage. There is just no argument about lb per sq in or about inches w.g. The only semblance of an argument is in the abbreviation. We are grateful to America for *psi*, but some of us are slow to use it, and a few even write lbs. p.s.i., making the two mistakes of putting an *s* on *librae* and taking the *p* for *per* instead of for *pounds*. But the metric system is in a worse mess than this.

Nothing to do with horsepower.

There are *three* standard atmospheres. In one of the systems of units based on metric standards the unit of force is the *Newton*, capable of imparting to a mass of 1 Kg an acceleration of 1 m per sec per sec. 100,000 Newtons per sq m is the *Bar*, whose daughter Millie meteorologists are so fond of. The standard atmosphere of physics (for which the abbreviation *atm* is recommended) is 1013 millibars. The usual unit for boiler pressures is written *at* in Germany and Italy and *atü* in Austria (*ata* for absolute pressure), and means Kg per sq cm. This is only 96.7% of a normal atmosphere, 14.2 psi instead of 14.7. The French Hp is 100 millibars.

Perhaps there is no good reason for us to be smug about keeping to Fahrenheit temperatures. As long as we do, it is useful to remember the easy way of converting to degrees C. Substract 32, divide by 2, add a tenth and a hundredth: e.g., 112°F (−32) = 80; 40 + 4 + 0.4 [+ .04 etc]) = 44.4°C. But when this has been done we should not call the result *Centigrade*. Strictly speaking, this is a measure of angle, a centigrade being a hundredth of a grade. Fortunately the scale was invented by a Swede called Celsius, and a majority of Europeans now talk of *Degrees Celsius*. Both Fahrenheit and Celsius inhabited localities where temperatures below freezing point were familiar (The Norseman's Hell contained icicles, not fire) and they had logical objections to negative degrees. To avoid them, Fahrenheit ascribed zero to the lowest temperature he could reach, and Celsius actually called the temperature of boiling water zero and that of melting ice 100.

Most heating engineers are familiar with °K and °R (*Kelvin* and *Rankine*) for degrees absolute on the Celsius and Fahrenheit scales, but there is still room for a distinction between *temperature* and *temperature difference*. A useful one that could be introduced is illustrated in "The water temperature was raised by sixty Fahrenheit degrees (60F°) to a hundred-and-ten degrees Fahrenheit (110°F) in the (elapsed) time of two hours."

British gas salesman.

Mr. Therm, who sells town's gas to British housewives, doesn't live in metric areas, and he is sadly missed. The Btu is a well-defined unit, and 100,000 Btu is a convenient quantity of heat. There are two *calories*. One is the heat required to raise a gram of water by one C degree, while the other relates to a *kilogram* of water and is written with a capital C, or called *kilocalorie* (Kcal). One French engineer deplores the lack of a convenient unit for expressing the annual outputs of heating appliances, "Millions of calories" is too clumsy, and so also is 10^6, especially when said in French (*dix puissance six*). He would like to call 1000 large Calories a Megacalorie, but radio fans are hardly likely to approve his proposed symbol, Mc. In 1913 Mr. Tanakadato of Japan tried to introduce a *Thermie* based on a tonne of water, and on its specific heat at 15°C. There is now international agreement that the large Calorie is 1/860th of a kwh, and some use a tonne calorie for a thousand times this unit.

There has recently been a further attempt to disturb those for whom the specific heat of water has always been 1. The 9th Conference of Weights and Measures in 1948 recommended the *Joule* as the unit of heat. This is absurdly small for heating engineers. A kilojoule is some 5% smaller than the Btu, but has the advantage of exact convertibility into electrical units. But of what value is this when there is always a loss if you do the conversion in actual practice?

Safety in Numbers?

It is essential to be able to visualise the units used by the other person, and this often means converting them into the exact units with which one is familiar. A 176 lb man means as little to an Englishman as 12stone 8lb to readers of this *Letter*. Areas in metric units must be converted into something that one can picture, such as square feet. But when all this is done there are still traps for the unwary in ordinary figures. "1,250 billion" means $1\frac{1}{4} \times 10^{15}$ in England, $1\frac{1}{4} \times 10^{12}$

Square feet.

(*Continued on page* 148)

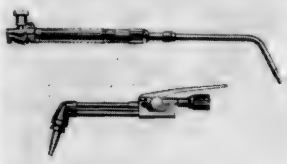
NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 134 for securing additional information on items described in this department.

Cutting Attachments, Gas Mixer

Cutting attachments and a jet-type mixer that extend the cutting, welding and heating range of the Airco Style 800 general purpose oxyacetylene torch, are announced by Air Reduction Sales Co., Inc., New York, N. Y.

The jet mixer handles all welding and heating tip sizes with flame stability. Rubber sealing rings provide a gas-tight seal with hand tightening.



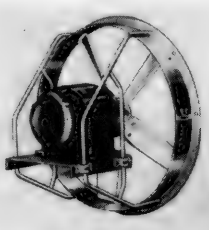
The cutting attachments are known as Airco Styles 1800 (medium duty) and 2800 (heavy duty). Style 1800 (upper illustration) cuts steel up to 6 inches thick and Style 2800 (lower illustration) cuts steel up to 8 inches thick. The company's standard cutting tips, any one of the tips designed for the Styles 3000 and 9000 hand cutting torches, may be used with the attachments. Consequently, the Style 800 torch, equipped with the heavy duty cutting attachment, can now handle a wide variety of cutting and gouging operations.

The attachments use a diaphragm-type valve for the control of cutting oxygen. This valve prevents gas leakage and eliminates the need for valve packing.

More information? Enter Item 1 on postcard, page 134

Heavy Duty Direct Driven Fan

A heavy duty, direct driven fan for industrial application and service industries where a large volume of air is required under static pressure has been developed and added to the line of fans manufactured by M & E Mfg. Co., Indianapolis, Ind. Where positive low cost ventilation exhaust is needed to remove fumes, vapors, smoke, and dust, the axial flow principle of the design of the heavy cast aluminum alloy blade shows its high operating efficiency.



The ring-mounted units are available in diameter sizes from 12-inch, delivering 980 cfm of air, to 48-inch delivering 32,400 cfm of air. Totally enclosed motors are furnished with the fans, providing the user with a minimum amount of installation labor and costs. For approximately 2½¢ per cfm, large volumes of air may be moved with this new direct drive fan.

More information? Enter Item 2 on postcard, page 134

Four-Way Valve

A hand-and-foot operated four-way valve with built-in, full-capacity, flow-control meters of the Venturi type, is announced by Airmatic Valve, Inc., Cleveland, Ohio. It is an air and low-pressure hydraulic valve, designed for the control of double acting air or hydraulic cylinders.

The valves are built for heavy-duty service and long operating life, featuring one balanced spool using renewable O ring type of packing. The flow control meters permit full-line volume without loss of pressure. Line-pressure variation will not affect valve function.

This basic valve is also suitable for remote pilot operation, cam, single or double solenoid together with time-delay features. Non-corrosive throughout, it is available in four standard pipe sizes, ¼, ⅜, ½, and ¾-inch, for air, oil or water, in pressure range from 0 to 150 lb.

More information? Enter Item 3 on postcard, page 134

Fiber Pipe

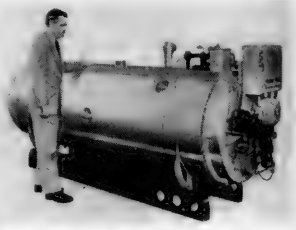
The new name L-M Perma-Line Pipe has been selected by Line Material Co., Milwaukee, Wis., for its bituminous fiber pipe. The name indicates the permanency of fiber pipe as proved by years of service. The company has applied for registration of the Perma-Line trademark.

The pipe has been known for over 25 years as L-M Fibre Pipe. It is manufactured in sizes two to eight inches.

More information? Enter Item 4 on postcard, page 134

Boiler Has Low Decibel Rating

A packaged boiler, called the CB, is announced by Cleaver-Brooks Co., Milwaukee, Wis., for use in commercial, industrial, and institutional structures. This self-contained boiler for processing or heating, steam or hot water use, offers big boiler performance never before available in small units of 15 to 40 hp.



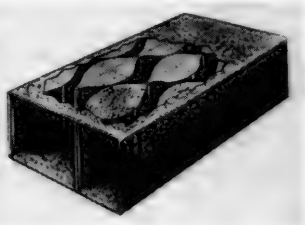
Silent operation, with remarkably low decibel ratings, makes the unit suitable for schools, hospitals, or institutions where sound levels are critical. The boiler burns light oils without difficulty, as well as gas, and can be quickly converted from one fuel to the other.

Greater heat absorption is gained in four-pass construction and minimum efficiencies of 80% are guaranteed by the manufacturer when firing with oil.

More information? Enter Item 5 on postcard, page 134

Quiets Conditioner Systems

A product called the Aircoustat that quiets fan and air noise in air conditioning systems, is introduced by Industrial Sound Control, Inc., Hartford, Conn. One standard 7 ft unit, for example, reduces noise level below what can be achieved by 100 ft of standard commercial duct lining. It is said that the device permits silencing of low frequency noise previously impossible to control. Pressure drop is less than when the entire duct is lined.



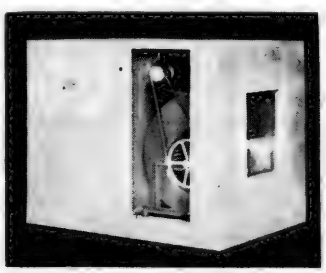
The company's product is installed directly into the duct work by means of flexible connections and can be located either between the fan and room or above individual diffusers. It is constructed of galvanized steel or aluminum and fits duct work of any design. Special formed-on flanges can be provided if desired.

The device is available in 11 standard sizes for use with different styles and sizes of ducts, and in three types to meet any desired conditions.

More information? Enter Item 6 on postcard, page 134

Commercial Evaporative Cooler

The rotary spray type evaporative cooler introduced by Hayes Furnace Mfg. and Supply Co., Los Angeles, Calif., retains the basic evaporative cooling principle but attains, it is said, 80% cooling efficiency. Air entering the cooler intake is pulled through a fine water spray and then through two sets of pads, the first of which is the evaporative pad, where cooling takes place, the second, where moisture is removed. The air then enters the blower and is discharged into the space. The cooler is designed for commercial and industrial installations.



The rotary spray unit is a perforated slinger wheel direct-connected to a ⅓ hp motor, 110 or 220 v, 60 cycle, single phase, 1725 rpm. The glass filter pads are mounted in the washer section of the cooler, thus preventing a build-up of salts and alkali. The fan is the centrifugal, multi-blade, blower type, complete with motor of standard make.

The cabinet is made up of two basic sections, the evaporative or washer section, and the blower section.

More information? Enter Item 7 on postcard, page 134

Rapid Water Hardness Test

Field tests of water hardness sensitive to one grain per gallon (17.1 parts per million) require only a minute with the Speedy-Kit, announced by Calgon, Inc., Pittsburgh, Pa. A sample of water is measured into a marked glass vial; two drops of Solution A are added from a bottle, turning the water red. Solution B from a second bottle then is added, one drop at a time, until the red color changes to blue. Each drop of B used represents one grain per gallon of hardness.

The method employed in using the new kit and the contents consisting of two bottles with eyedropper tops and one glass vial, represent a simplification of water test procedures based on Schwarzenbach methods now widely used in the United States and other countries. The simplified test employed with the kit is expected to be of special value to laundries, appliance company and utility company service men, and others who frequently need to make routine water-hardness checks.

The kit is of pocket size, 4⅝ inches long, 3 inches wide, 1⅛ inches deep, and weighs only 6 oz. The box is made of sturdy, clear plastic. A water-resistant instruction card is secured in the lid. Contents include glass vial, glass bottle of solution A and plastic bottle of solution B.

The kits make it possible to field-check water hardness at a very low cost for each test, according to the company. There are sufficient reagents in a kit for 50 to 100 tests, depending on water hardness.

Complete details are in a new bulletin 5RE54, available upon request.

More information? Enter Item 8 on postcard, page 134

Solvent Resistant Packing

Two mechanical rod packings have been developed by Flexrock Co., Philadelphia, Pa., using new lubricant and impregnation process for handling non-water soluble solvents, such as benzene, carbon tetrachloride, xylene, turpentine, kerosene, gasoline and Stoddard solvents.

Style No. 181 has a square-braided rayon base, and is recommended for pumps, valves and fittings, handling such chemicals at temperatures up to 200 deg F. For temperatures above 200 deg F., Style No. 1024, which has a high-grade, braid-over-braid white asbestos base, is recommended.

More information? Enter Item 9 on postcard, page 134

Compact Commercial Chiller

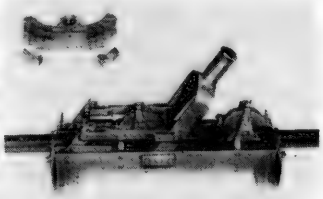
The Flow-Cold packaged liquid chiller of Acme Industries, Inc., Jackson, Mich., is re-designed to make it easier to install and maintain. The chiller comes in 6 models ranging in capacity from 2 to 15 tons.

It is a small, complete, compact unit for air conditioning and refrigeration in small industrial, commercial and residential applications. These units can cool water, handle coolant cooling for metal working, do mold cooling, chill liquid brines and provide air conditioned comfort for homes and offices.

More information? Enter Item 10 on postcard, page 134

Puller and Pusher Dog

The new gripping dog, developed by The Trojan Mfg. Co., Troy, Ohio, for use on its Model B pipe puller and pusher is said to increase the life of the dog four times and cut maintenance costs correspondingly. Individual inserts made of high quality steel, carbonized, are used for each step on the dog. All inserts are interchangeable with one another, and can be replaced by inexpensive new inserts, thus eliminating the necessity of buying a complete new dog.



The pipe puller and pusher on which the dog is used is designed to install or renew pipe under pavement without breaking the surface and push or pull pipe up to 2 inches diameter without additional dogs, clamps or wedges. It requires only a 5½ ft trench, saves time by eliminating resetting of the grip, has three pushing speeds for different types of soil, and can be reversed in 30 seconds by turning the dogs over in the opposite direction.

Contructed entirely of steel, with the frame welded into one member, it weighs 140 lb.

More information? Enter Item 11 on postcard, page 134

1,000-Watt Lamp Weighs 7/8 Oz.

Development of a new type of infrared lamp, for scores of heating, drying, baking, cooking, and other uses, is announced by General Electric Co., Cleveland, Ohio. It comes in a tubular shape, slightly larger in diameter than a cigarette. The tube is made of fused translucent quartz, and is virtually shock proof.

Two sizes are being introduced, of 500 and 1000 watts, for use on circuit voltages of 115-125 and 230-250, respectively. They have lighted lengths of five and ten inches, metal clips on either end adding about 1-¾ inches to the overall lamp length. From each end extends a flexible six-inch lead wire. The 500-watt size weighs ¾ oz, and the 1000-watt size ⅞ oz, as compared with an ordinary teaspoon, which weighs one ounce. The lamp has a rated burning life of more than 5000 hr, and produces 100 watts per lighted inch.

House-heating equipment and space heaters are seen as important outlets for the quartz limp. A ceiling heater incorporating the lamp could provide some illumination, as well as heat. Other types of unit that might utilize the tube include electric fireplaces, and portable and wall-mounted heating devices. Installation could be made at the entrances to stores, and other establishments, to keep window shoppers warm. Similar installations are seen as desirable for bus and railroad waiting stations.

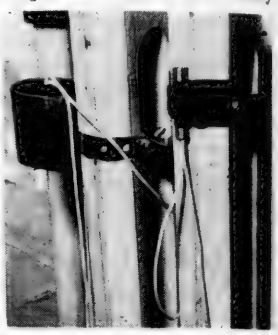
On the farm the lamp can be employed in brooders for chickens, pigs and other animals, and in the thawing of frozen pumps, heating of milk-houses, and similar applications.

Samples are now available to manufacturers wishing to develop equipment in which the quartz infrared lamp may be used. List prices of the new lamps are: 500-watt size, $7.00; 1000-watt size, $8.50.

More information? Enter Item 12 on postcard, page 134

Gages Radiator Temperature

A system to measure the temperature of electronically controlled heating regulators has been developed by Minneapolis - Honeywell Regulator Co., Minneapolis, Minn. Known as the L-7016 Steamstat, it consists of 12 resistance capsules mounted in a geometric pattern on the back of the radiator, which, it is said, gives an average radiator temperature measurement.



Mounting straps and saddles are provided and each bulb includes a 30-inch length of conductor to permit proper installation of the elements at desired points on the radiator.

The unit has no moving parts and requires no maintenance. All adjustments are made in the heat stabilizer panel to which it is connected.

More information? Enter Item 13 on postcard, page 134

Seven-Inch Sander-Grinder

A new 7-inch heavy-duty sander-grinder for continuous production service is marketed by The Black & Decker Mfg. Co., Towson, Md. The tool performs almost all types of surfacing operations, and can be used with abrasive discs or other accessories.

The company's Universal motor, which is included, has 90% more power than the one in the 7-inch sander, yet the new sander-grinder is lighter, weighing only 14 lb. Air from the motor is deflected away from the operator. The switch is enclosed to keep out abrasive dust, and guards prevent the switch from being knocked on accidentally.

The tool is used for sanding and grinding and is designed for fast material removal. It smooths welds and casting ridges, cuts off studs, bolts and rivets, and can be used for wood surfacing, semi-finish, gouging and shaping. Using a wire cup brush, the tool removes paint, rust and scale and cleans castings, tanks, and similar work.

More information? Enter Item 14 on postcard, page 134

Hook-on Volt-Ammeter

A hook-on volt-ammeter with automatic scale changing is announced by General Electric Co., Schenectady, N. Y. Designated the AK-5, the pocket-sized unit measures current and voltage quickly and accurately. Its automatic scale changing feature eliminates the possibility of reading the wrong scale for the application, according to company engineers.

For balancing circuits, tracing faults and grounds, estimating distribution circuits, and diagnosing operating troubles, the volt-ammeter is an aid to engineers, contractors, maintenance and service men, and many others.

It clamps around any conductor up to two inches in diameter. The contoured trigger closes and opens the hook-on assembly, which is covered with insulation to safeguard against grounding or short-circuiting. Range and scale are obtained by turning the unit's switch knob.

The device is shock-resistant and is provided with screw-in voltage leads. It weighs 1¼ lb and measures 9⅛ x 3 7/16 x 1 9/16 inches.

More information? Enter Item 15 on postcard, page 134

Fungi-Resistant Membrane

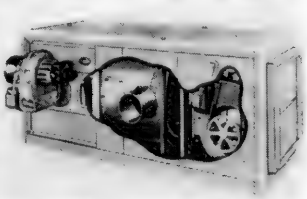
A development in the use of membranes in slab-on-ground construction and over crawl space where the slab is not poured on the ground is Type 65 Fungi-resistant of The Richkraft Co., Chicago, Ill. It was accepted on January 20, 1954 by FHA.

The kraft liners are pretreated with a special fungicide before being combined into the final product. Edgestring reinforcement helps prevent rips and tears. Tests indicate that the material has a tensile strength almost twice that of 55 lb roll roofing. It is available in rolls 36 and 48 inches wide, 432 sq ft; 60, 72, 84 and 96 inches wide, 1,000 sq ft each. The material weighs approximately 14.5 lb per 100 sq ft.

More information? Enter Item 16 on postcard, page 134

Oil Fired Air Conditioner

A compact unit that can be installed in any convenient spot, or suspended from ceiling joists to save floor space, is the 532 oil fired horizontal winter air conditioner of Thatcher Furnace Co., Garwood, N. J. Designed as it is for small houses where space is at a premium, the unit also provides a solution to many commercial heating problems, garages, small shops, stores, service stations, and restaurants, for it easily connects to most types of warm air heating installations and leaves floor area entirely free for productive use.



The unit is factory assembled and comes in three sizes, 82,500, 115,000 and 165,000 Btu per hour at the bonnet. The rounded corners and attractive two-tone maroon and gray crinkle finish meet the company's standards for appearance and design.

More information? Enter Item 17 on postcard, page 134

Cleans Drains by Impact

A 30-day free trial of its water ram, used for cleaning clogged drain pipe and sewers, is announced by The Hydraulic Mfg. Co., Kiel, Wis.

Sudden release of a slug of compressed air, which strikes a solid water column against the stoppage in the pipe, delivers an impact that cleans stubborn drain blocks.

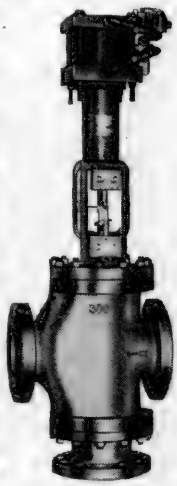
The ram is used as a maintenance tool for any sizable building, regardless of classification, wherever sluggish or blocked drain lines or sewers occur. It serves the entire drain system of a building from drinking fountains to six-inch sewers. Maintenance men can easily follow the step-by-step operating instructions.

The ram has been field tested, and endorsed by industrial plants and university testing laboratories. Specifications and details of the 30-day free trial offer sent on request.

More information? Enter Item 18 on postcard, page 134

Cylinder-Operated Valve

A three-way, cylinder-operated valve, announced by Kieley and Mueller, Inc., Middletown, N. Y., combines high travel with extreme speed on both the pressure stroke and spring return.



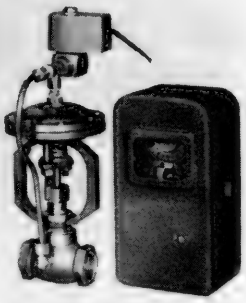
When used as an emergency diversion valve with less than 100 psi on the cylinder, full travel with tight shut-off is accomplished in 0.5 second. On spring return, the same high speed operation can be achieved. Use of the spring return, rather than double-acting cylinders, permits the valve to fail in either the open or closed position as required for maximum safety under emergency conditions.

While the valve is provided with quick-operating ports for emergency service, it is also available with V-ports and valve positioners for throttling applications, and can be supplied in any machineable metal in standard sizes from ½ to 10 inches with either Teflon or greased lubricant stuffing boxes. Position indicators with an accessible open yoke of all-steel, shock-proof construction are standard.

More information? Enter Item 19 on postcard, page 134

Lawn Sprinkler Control

The new Greenland automatic lawn sprinkler control of Superior Controls Co., Inc., Los Angeles, Calif., operates on any watering schedule with the setting of a dial and enables the user to take a vacation with the assurance that his lawn and garden are being adequately watered in his absence.



Equipped with a Telechron, synchronous, self-starting 120-v, 60-cycle motor, the entire unit is set in a heavy gage steel housing, weather resistant to below zero temperatures.

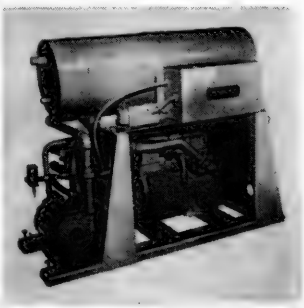
The sprinkler control valve body is made of heavy cast bronze. The valve is the full flow type with swivel type disc and stem, which is corrosion-proofed and easily replaced. A built-in shut-off prevents flooding in case of power failure, but the cycle will automatically be completed when power is resumed. The service rating is 125 lb per sq inch.

Sprinkler valves in sizes ¾, 1, 1¼, 1½-inch, and four types of timer controls adapt the system to individual needs.

More information? Enter Item 20 on postcard, page 134

Pump for Year Round Comfort

The Flow-Temp heat pump which provides year round heating and cooling in all climates, for any type installation and under any conditions, has been redesigned by Acme Industries, Inc., Jackson, Mich. This one package is a compact, year round temperature control system in which the heat source is water and the power source is electricity. Therefore it provides flameless, efficient heat and eliminates fuel supply worries, soot, grime, and odors, according to the company.



In the summer the unit provides cool, dehumidified comfort by flipping a switch to change the water flow from heating to cooling.

The pump comes in six models that can deliver from 26,000 to 252,000 Btu per hour.

More information? Enter Item 21 on postcard, page 134

Warehousing System Announced

A refrigerant warehousing system providing faster service and prepaid shipments to wholesalers' warehouses, is inaugurated March 1 by E. I. DuPont De Nemours & Co., Wilmington, Del. Under the plan, 26 regional warehouses will stock Freon-12 in 10-, 25-, and 145 lb cylinders, Freon-11 in 200 lb drums, and Freon-22 in 9-, 22-, and 125-lb cylinders.

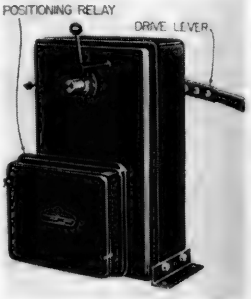
Shipments will be made to the warehouses of authorized distributors and wholesalers free of charge, with most of the shipments by truck.

Regional warehouse order points sent on request.

More information? Enter Item 22 on postcard, page 134

Improves Flow Regulation

Gas and liquid flow regulation may be improved by use of a small, pneumatically operated control drive, introduced by Bailey Meter Co., Cleveland, Ohio. Butterfly valves, dampers and feeders may now be operated on a straight-line flow characteristic.



A pneumatic signal actuates a positioning relay that in turn positions a piston-operated drive lever arm. Three different characteristic cams are supplied and may be shaped if necessary.

The drive is 10 x 11 x 19 inches and may be installed in any position on a column, pipe or flat surface. The time required for the full travel of 75 deg is adjustable. The drive has a 4 inch piston stroke at a torque of 75 ft-lb. It operates on standard SAMA signal ranges 3-15 and 3-27 psig. Standard connecting linkage is available from stock.

This control drive is available from stock at $210.00 f.o.b. Cleveland, complete with enclosure, positioning relay and hand operator.

More information? Enter Item 23 on postcard, page 134

Quick-Change Trencher Cutters

A new type chisel cutter for its tractor-mounted trencher, the Blackhawk Trench Hog, is introduced by Arps Corp., New Holstein, Wis. The cutter is designed for digging in hard pan, adobe clay, caliche, frozen ground and very tough conditions. The cutters are forged of high carbon steel and are heat treated for toughness.

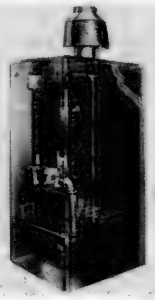
The cutters are inserted in brackets bolted to the cutter chain. The cutting bits, when worn, are simply and quickly knocked out of the hold brackets, and are just as easily replaced. They can dig trenches 8 through 18 inches wide. The photograph shows the chisel cutters digging through a 22 inch diameter solid elm stump.

The new cutters supplement the standard, slicer cutters used for wet, sticky soils, gumbo, heavy clay, as well as normal soils.

More information? Enter Item 24 on postcard, page 134

Gas Hot Water Boiler

The Delco-Heat Quik-Action gas boiler of Delco Appliance Div., General Motors Corp., Rochester, N. Y., is designed for hot water applications. The boiler comes in seven models having AGA capacity ratings ranging from 70,000 to 340,000 Btu per hr input, with boiler loads from 373 to 1813 sq ft of radiation.



Model GB70 is 38¼ inches high, 16½ inches wide, and 19½ inches long, including the jacket. Larger models are the same height and width, but the length increases with additional boiler sections, the maximum being 48 inches for model GB340. Boiler sections are cast iron and all but the two largest models are factory assembled, sealed and tested.

A fiberglass insulated jacket of 20 gage furniture steel finished in baked-on green enamel completely encloses the boiler. An access panel, which is louvered for ample combustion air, facilitates entrance to the burner and controls. Standard hot water and gas controls are included with each unit.

More information? Enter Item 25 on postcard, page 134

Low Temperature Dryer

A high speed continuous low temperature dryer is announced by Surface Combustion Corp., Toledo, Ohio. This dryer is applicable to the processing of materials such as gelatin, glue, and soap, which are temperature-sensitive. The low relative humidity required for drying is obtained by dehumidification of the air rather than by raising of the air temperature.

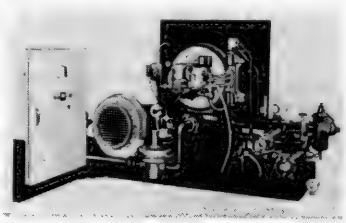
The dryer consists of Kathabar dehumidification equipment for drying the air, an air distribution system, and conveying equipment for handling the raw material. A heat exchanger system delivers to the belt material, such as gelatin and glue, in a form suitable for fast drying.

The dryer is available in standard sizes ranging from 100 lb per hr to 2000 lb per hr.

More information? Enter Item 26 on postcard, page 134

Packaged Gas and Oil Burners

A series of packaged gas burners, oil burners, and combination gas-oil burners for commercial-industrial heating and power applications is announced by Petro, Cleveland, Ohio. Each unit is assembled, wired, piped, and tested at the factory; components are mounted on a structural steel base.



Seven stock sizes are included in the line. Gas burners range from 3,750,000 to 24,000,000 Btu per hr input; oil burners, from 25 to 145 gph. Each unit is equipped with an enclosed electrical control panel and with a forced draft fan that delivers necessary air against a positive furnace pressure.

Combination gas-oil models permit quick changeover from one fuel to another. Combination units and straight gas-fired units include the company's low pressure ring-type gas burner, automatic gas controls, air volume control, and an electronic combustion control system.

More information? Enter Item 27 on postcard, page 134

Motorpump for Air-Conditioning

An air-conditioning centrifugal pump, known as the ¾ KRVSA Motorpump, is introduced by Ingersoll-Rand Co., New York, N. Y. It is a single stage, 3450 rpm unit with a keyed, cap screw type impeller attachment for positive fastening. The smooth bronze, die cast, balanced impeller has a built-in shaft sleeve to prevent motor shaft corrosion.

Standard jet pump motors ⅓ thru 1 hp are used, and the pump will deliver capacities to 48 gpm at heads to 100 ft. A mechanical seal consisting of a rotating ceramic face against a stationary Teeplelite face prevents stuffing-box drips and eliminates motor overloads.

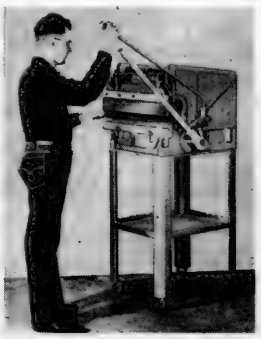
This new pump is designed and constructed for air-conditioning and refrigeration service.

Bulletin #7126-D is available.

More information? Enter Item 28 on postcard, page 134

Hand Operated Press Brake

A 24-inch hand operated press brake rated at eight-ton capacity is announced by O'Neil-Irwin Mfg. Co., Lake City, Minn. Designated Di-Acro press brake, this machine is said to incorporate a special cam lever mechanism that provides power for forming, blanking, piercing, drawing, and trimming operations plus a ratchet drive system that greatly multiplies the power for heavy forming jobs.



Designed to relieve large production models of short run forming operations, the press brake is compact enough for use in experimental engineering and model shops.

This hand operated brake will form 16 gage mild sheet steel across the full 24-inch forming width, 10 gage mild sheet steel across a 12-inch forming width as well as form Inconel, brass, aluminum, stainless steel, chrome molybdenum and other ductile materials.

The stroke of the ram is 2 inches; depth of throat is 6 inches.

More information? Enter Item 29 on postcard, page 134

Drives Fasteners into Steel

Designed to drive heavy shank fasteners into structural steel plates up to an inch thick and into hardest concrete is a new powder-actuated tool, the Super-Power Jobmaster of Ramset Fastener Div., Olin Industries Inc., Cleveland, Ohio. It is designed for plumbers, steamfitters, installers of sprinkler systems, bridge workers, for heavy-construction and marine uses.

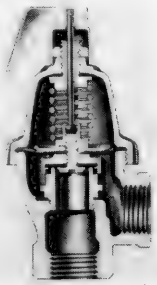
Pins and studs driven into one-inch structural steel with the device have a holding power up to 10,000 lb.

The tool weighs less than 8 lb. and is 15 inches long. It is designed for either one-hand or two-hand operation and sets pins and studs 3/8-inch diameter at an average rate of one a minute. Compared with the company's older heavy-duty tool, this new model is almost 3 lb. lighter, is 4 inches shorter, and can be operated with one hand. Further, its cocking pressure is reduced by about one-half, permitting easier use of the tool in hard-to-reach areas.

More information? Enter Item 30 on postcard, page 134

Hot Water Relief Valve

The introduction of its No. 103 relief valve is announced by Taco Heaters, Inc., Providence, R. I. Tested and approved under the ASME code for a discharge capacity of 326,000 Btu per hr at 30 psi, it is suitable for approximately 80% of all hot water heating installations.



The valve features a bronze body and dome, high temperature non-sticking silicone rubber disc, stainless steel spring, nylon reinforced Hycar rubber diaphragm, and renewable bronze seat.

More information? Enter Item 31 on postcard, page 134

Greenhouse Vent Controllers

An improved greenhouse ventilation control, the T-820D thermostat, which opens and closes ventilator windows, has been developed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The thermostat uses built-in heating-cooling anticipation elements to coordinate the movements of the vents with minute temperature changes in the greenhouse. It is so sensitive it can detect a fraction of a degree of indoor temperature change caused by clouds, shade or other changes in outside conditions.

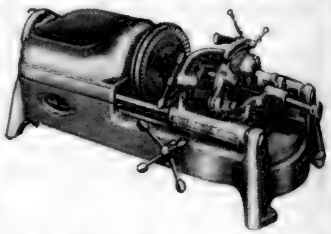
When an outside change occurs and the indoor temperature starts to drop, the thermostat signals a motor which moves the vents toward the closed position. At the same time the built-in heater elements apply heat directly to the thermostat, thus anticipating the effect of closing the ventilators. When the sun reappears the thermostat is artifically cooled and the ventilators are opened until balance is again established.

The 1/6-hp instantly reversible motor can be adapted to a conventional ventilation system by removing the manual crank and connecting the motor shaft to the crank handle shaft. Humidity control is obtained through the installation of the company's humidity controller. Freeze-up protection is provided by the company's T-615 temperature controller, which keeps ventilators closed tight as long as icing conditions prevail but permits manual operation if desired.

More information? Enter Item 32 on postcard, page 134

Chuck Utilizes New Principle

A new speed-grip chuck that grips positively both forward and reverse is a feature of the new Ridgid 500A pipe and bolt threading machine of The Ridge Tool Co., Elyria, Ohio. The manufacturer maintains that the speed-grip is not a hammer-type chuck but uses a new gripping principle.



Operation is without effort. Jaws are closed on the work with a light sock of the handwheel and motor power further tightens the grip, which is released by a turn of the handwheel. This chuck adds to the easy threading, cutting and reaming operations of the company's pipe threader. All tools can be used separately. Quick-opening Quadra, Dual and Mono die heads are available; also bolt, conduit and special dies. Capacity of the machine is 1/8 to 2-inch pipe or conduit, and 1/4 to 2-inch bolts.

More information? Enter Item 33 on postcard, page 134

Two Backfill Tampers

Two backfill tampers, designated as models DT-32 and DT-42, are announced by Davey Compressor Co., Kent, Ohio.

The DT-32 is in the medium weight class of 35 lb with a length of 47¼ inches. Body maximum diameter is 3 inches and butt diameter is 6 inches.

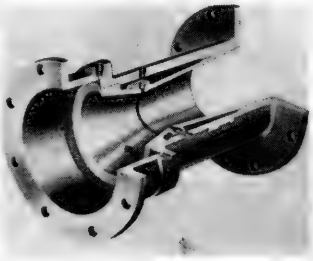
The DT-42 (illustrated) is designed to meet the requirements of operators for an extra hard-hitting tool. It has more than double the work capacity of medium weight tampers and is said to speed up tamping jobs without increasing labor cost. Weight is 45 lb; length, 47¼ inches; body maximum diameter, 3¾ inches and butt diameter, 6 inches.

Both tampers possess a high degree of parts interchangeability, and can be frame mounted to permit the operation of three tools simultaneously.

More information? Enter Item 34 on postcard, page 134

Metering Liquids and Gases

A device known as the Dall flow tube for metering liquids and gases is announced by Builders-Providence, Inc., Providence, R. I. It consists of a short, flanged, cylindrical body designed with an abrupt decrease in diameter, followed by a conical restriction and diverging outlet.



The reduced area at the cone entrance and the annular throat induce the high differential pressure obtained; the diverging outlet cone provides the high recovery of differential pressure.

Features of the tube include small permanent head loss, short length and low weight to provide for easy installation, Meehanite iron body, corrosion resistant bronze liner, minimum maintenance provided by unobstructed flow path, accuracy assured by precision machined bronze throat liner, and low cost from compact design.

More information? Enter Item 35 on postcard, page 134

Compact Inner-Fin Chillers

A line of inner-fin chillers for use in chilled water air-conditioning systems and other liquid cooling applications is introduced by Heat-X-Changer Co., Inc., Brewster, N. Y. Copper inner-fins in refrigerant passages greatly increase the heat transfer efficiency, while permitting smaller size and lower cost.

The chillers have completely non-ferrous water passages to prevent any corrosion problems. The refrigerant side is the single-pass type to eliminate any oil trapping problem. Selection of water baffle spacings is available to meet a wide range of water pressure drop requirements, and rock cork insulation is available on all sizes.

An illustrated bulletin containing complete specifications is available.

More information? Enter Item 36 on postcard, page 134

Oil Burner Motors

A net price reduction of more than five percent on ⅛-hp oil burner motors in lots of 500 is announced by General Electric Co., Schenectady, N. Y. Smaller reductions have been made on 1/6-hp models.

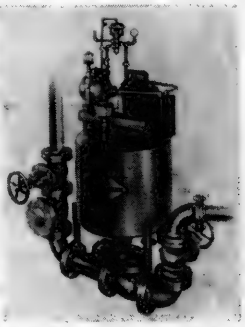
The second such decrease on oil-burner motors since the introduction of the company's Form G motor line two years ago, the savings are the resut of improved manufacturing techniques and accelerated production, according to the company. During the Spring of 1952, the quantity price was reduced nine percent, making a total reduction of about 14 percent since that time.

The G-E oil-burner motor is designed to allow construction of smaller and more compact furnaces. Both 5½-inch rabbet and 6⅜-inch rabbet mountings are available. An offset pulley-end-flange oiler allows the standard pulley-end flange to be rotated 90 degrees counter clockwise from normal assembly if required.

More information? Enter Item 37 on postcard, page 134

Pneumatic Sewage Ejector

A packaged pneumatic ejector for low flows, called Packex, announced by Yeomans Brothers Co., Melrose Park, Ill., is designed for small building and subdivision lift stations, such as small apartment buildings, offices, small schools, trailer parks, and small residential areas. It is suitable for capacities to 20 gpm with a 20-ft head, and for use with either a 3-inch or 4-inch inlet and discharge fitting. A sanitary unit, the ejector has an hermetically sealed pot to eliminate odor and gas. It has no bearings in the pumping unit to wear, no stuffing boxes to repack, and no shafting to keep aligned.



The ejector takes over when it is not practical to scale down a centrifugal pump to 20 gpm, since at such reduced volume, it is said, a centrifugal pump requires a screen or a mechanical shredder to pass solids that normally enter a system. The ejector will pass all solids that enter the pot, according to the manufacturer.

More information? Enter Item 38 on postcard, page 134

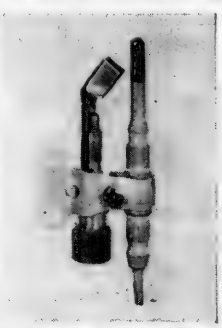
Increased Rating of Motors

Increase in ratings of its TEFC and explosion-proof motors to 150 hp is announced by U. S. Electrical Motors, Inc., Los Angeles, Calif.

More information? Enter Item 39 on postcard, page 134

Gas Pilot Free From Clogging

A pilot introduced by Robertshaw-Fulton Controls Co., Youngwood, Pa., for use in gas operated appliances overcomes the susceptibility of ordinary pilots to linting and clogging at the primary air intake, according to the company. The pilot does away with such air intakes and maintains the steady blue flame needed for proper safety control operation.



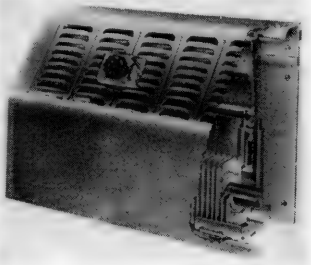
Clogging at the primary air intake, it is said, causes ordinary pilots to give off a yellow flame, which does not transfer sufficient heat to the thermocouple. The absence of ample heat to the thermocouple results in insufficient millivoltage output and false safety shut-off.

Fabricated from stainless steel, the new target pilot has been thoroughly tested and offers dependable, maintenance-free operation, the company says.

More information? Enter Item 40 on postcard, page 134

Slope-Top Radiant Baseboard

A high capacity baseboard introduced by Kritzer Radiant Coils, Inc., Chicago, Ill., for hard-to-heat areas such as schools, hospitals, and office buildings has slope-top design for greater convection-radiation effectiveness, is fabricated from automobile gage steel with louvered front, and covered with a corrosion resistant finish over which any paint may be applied.



The damper is mechanically suspended from the baseboard frame, and does not use springs, chains, or hinges. The damper control operates positively from any point in the baseboard run; two set screws hold it in place.

The coil support bracket is made up of the support bracket proper, an adjustable stirrup, and a sliding cradle.

The finned heating coils fit into the cradle, which rides on the stirrup. This provides quiet expansion and contraction of the coils during the heating and cooling cycles.

More information? Enter Item 41 on postcard, page 134

Line of Horizontal Circulators

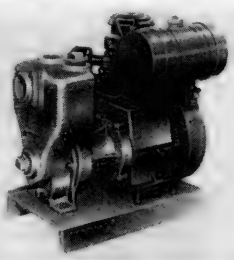
With the addition of the new HC25 2½-inch circulator, Taco Heaters, Inc., Providence, R. I., can offer a complete line of horizontal circulators from ¾- up to and including four sizes of 3-inch units.

All sizes are now available in bronze as well as cast iron.

More information? Enter Item 42 on postcard, page 134

Lightweight Centrifugal Pumps

An improved line of lightweight, heavy duty, self-priming contractors type centrifugal pumps is announced by Universal Mfg. Co., Berkeley, Calif. A balanced priming port, preventing loss of volume from re-circulation of water; non-clogging, semi-open impellers with adjustable clearance to compensate for wear; and a new convertible wear plate to prevent wear on the impeller case, are featured. Easy priming is possible, without extra fittings or disturbance of piping, through a separate opening in top of the pump case. These pumps are rated for continuous duty as well as for intermittent service.



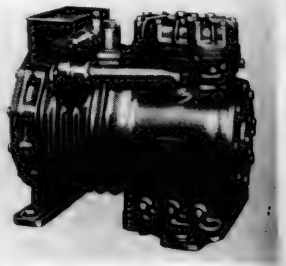
The heavy duty units are suited for de-watering excavations as well as for draining of ponds and ditches; and are constructed to handle unclear water, drainage and, generally, the rapid movement of large volumes of water.

Bulletin J-123 is available.

More information? Enter Item 43 on postcard, page 134

Motor-Compressors

Several sizes of Copelametic motor-compressors are offered with suction cooling by Copeland Refrigeration Corp., Sidney, Ohio. These range up through 3 hp.



In these models the gas cools the motor by passing through a chamber around it. The Freon does not come in contact with the oil at any time. Through this design, it is said the motors will not require cooling by water or air.

Just as in all the company's units, the motor and compressor are accessible for service on the spot if ever required. There are no belts or seals in this direct-drive accessible hermetic, nor is manual lubrication needed.

More information? Enter Item 44 on postcard, page 134

Polyvinyl Chloride Sheets

The availability of Type I and Type III, non-plasticized polyvinyl chloride sheet in various thicknesses measuring 9 x 4 ft is announced by The Atlas Mineral Products Co., Merztown, Pa. These heat weldable products are supplied in standard thicknesses ranging from 10 thousandths of an inch to 2 inches.

Type I, optimum chemical resistant sheet, is supplied in black color under the trade name Ampcoflex. Type III, optimum impact sheet, is supplied in grey color under the registered trade name Pee Vee Cee.

Welding rod for fabrication of structures is available to trained plastic welders. Fabricated ductwork, extruded pipe, fittings, valves and other injection molded non-plasticized polyvinyl chloride parts are also available.

More information? Enter Item 45 on postcard, page 134

Small Cooling Tower Line

The addition of a 15-ton capacity unit to its line of small cooling towers for houses, offices and factories is announced by Acme Industries, Inc., Jackson, Michigan. Called the Model JACT, the addition of this unit gives the air conditioning and refrigeration contractor a total of 5 sizes to choose from the Acme line. It makes it possible to select a unit to match a small air conditioning system of a house or a cooling system for a group of offices. Capacities of the 5 sizes range from 3- to 15-tons.

All units are galvanized after fabrication. The blower and fan system assure constant capacity, regardless of wind conditions.

More information? Enter Item 46 on postcard, page 134

(*Concluded on page* 128)

Says **William H. Bodendorf,** Pres.
WILLIAM H. BODENDORF & SONS
Westfield, Mass.

"IN MY EXPERIENCE
RADIANT PANEL HEATING WITH
COPPER WATER TUBE
IS THE MOST EFFICIENT AND ECONOMICAL
WAY TO HEAT A HOME"

Mr. Bodendorf has been in the heating business for 30 years and in the radiant heat field for 9 years. He prefers radiant panel heating, using copper water tube, to all others. Here's why:

"Heat is distributed more evenly . . . there are no hot and cold zones, no drafts, so radiant panel heating is healthier. Also, it permits greater latitude in room arrangement, and more usable space. There is less cleaning and decorating to do than with conventional heating systems, while operating costs are invariably less.

"From my standpoint as a contractor I prefer Revere Copper Water Tube because it is easy to bend and handle . . . its long 60' lengths require fewer fittings and the solder fittings used eliminate the need for welding, wrench work and thread cutting. And most important; Revere Copper cannot rust so it keeps me out of trouble, helps build my reputation for quality work."

That Mr. Bodendorf has a reputation for quality work is attested to by the fact that of the more than 550 radiant panel installations he has made, he has never received a single complaint.

You, too, can keep out of trouble with Revere Copper Water Tube. Use it for radiant panel heating, hot and cold water lines, underground service lines, air conditioning and processing lines, waste stack and vent lines. There is a Revere Distributor near you who carries a full supply of Revere Copper Water Tube in various sizes and tempers. And if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

ONE BIG FEATURE of Revere Copper Water Tube is that Radiant Panel Heating coils are readily prefabricated in the shop. Time is saved, working conditions are more ideal, installation costs are cut. BODENDORF & SONS get their Copper Water Tube needs through the Revere Distributor, WARNER SUPPLY COMPANY, Westfield, Mass.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

(*Concluded from page* 126)

Enclosing Jacket for Boiler

An enclosing jacket for its No. 770 boiler-burner unit is announced by Fitzgibbons Boiler Co., Inc., New York, N. Y. This completely pre-assembled and wired, oil-fired unit was available before only with a flush jacket.

The jacket, which is optional, is made of 20-gage steel. The jacket comes fully erected and attached to the unit, saving the time usually required for that operation. This carries out the basic design of the unit, which is for the elimination of all boiler and burner assembly work on the job.

The standard model includes a flush jacket with all accessories and boiler specialties necessary for any type of forced hot water heating system, and the company's Tanksaver for continuous instant domestic hot water.

Catalog 770-10 is available.

More information? Enter Item 47 on postcard, page 134

Fin for Cooling, Heating Coil

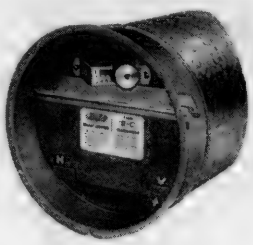
A Delta-Flo fin design which improves the efficiency of extended heat transfer surface is announced by The Trane Co., La Crosse, Wis. The fins will be used on the company's heating and cooling coils. They have a delta-shaped (triangular) ridge formed near the leading edge of the fin surface, as well as in front of each row of tubes in multi-row coils. This delta ridge increases air turbulence over the entire fin surface, reducing the insulating film of dead air present on some flat fin types.

Addition of the delta ridge on the fins increases fin strength and helps protect the coil from damage caused by rough handling. Because the fins are more efficient and can be placed further apart, coils stay cleaner longer. They are mechanically bonded to coil tubes in a solderless joint that is said to be as strong as the metal itself and to provide maximum heat transfer efficiency.

More information? Enter Item 48 on postcard, page 134

Calibrated Draft Control

A new model in its R series line, the R-C, calibrated to indicate draft settings, and featuring a reversible wing-flap gate that adapts the control to the differing needs of a vertical as against a horizontal flue is announced by Field Control Division, Mendota, Ill.



The control is available in full 7- and 9-inch sizes. The 7-inch size fits a 6-, 7- or 8-inch flue; the 9-inch size fits an 8-, 9- or 10-inch flue. Because the collar is round, the off-size installations can be made without air leakage and without distortion of the flue pipe. The round collar also allows for rotation of the control ring and gate to permit a level installation in a sloping flue, which assures that the gate always can function properly.

There are no flanges or obstruction on the ring to reduce air flow.

More information? Enter Item 49 on postcard, page 134

Five-Ton Air Conditioner

The five-ton Weatherwise CU air conditioning units, manufactured by Barkow Mfg. Co., Milwaukee, Wis., have a new type filter grille with two rows of inverted louvers that direct the air upward through the filter screen. This improvement protects the filter and assures longer life and greater efficiency.

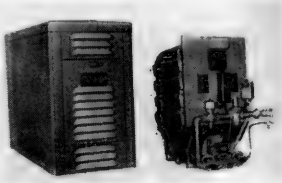
The CU-5 air conditioner is a self-contained unit designed for commercial use. It features a hermetically sealed compressor with Freon, the capillary system, and complete thermostatic control. Tests show that the unit exceeds its rated capacity by as much as 15 to 20%.

A packaged unit, it is shipped assembled, ready for simple installation. The conditioner is also available in a three-ton size with plenum for duct work installation.

More information? Enter Item 50 on postcard, page 134

Gas-Fired Hot Water Boilers

A line of gas-fired cast iron hot water boilers covering a capacity range from 45,000 Btu per hr input to 450,000 Btu per hr input is introduced by Hydrotherm, Inc., Northvale, N. J. Horizontal sections with zig-zag circuit will permit the absorption of more heat per lb. of cast iron. The low-water content of the boiler gives quick heat response and minimum override. All models, except the largest, are completely assembled and wired at the factory ready for installation with minimum field labor. An attractive gray hammeroid jacket encloses all boiler controls.



All boilers are AGA approved for operation on manufactured, natural and L.P. gas and carry a 100 lb. ASME working pressure rating. The boiler is especially suited for radiator, baseboard, convector and radiant panel heating in houses, apartments, schools, churches, motels, and commercial and industrial establishments.

Midget models meet cost and space requirements for mass produced housing.

More information? Enter Item 51 on postcard, page 134

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Plastic Pipe Cuts Rust in Water Heaters

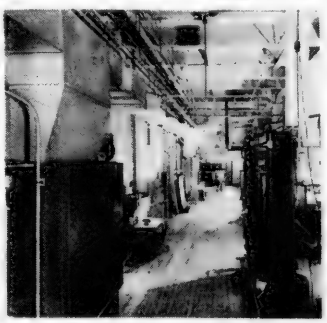
PROBLEM: In galvanized steel storage tanks used with many service hot water heaters a centrally suspended dip tube is used to convey cold water from the top of the tank to the bottom close to the source of heat. When such tubes are made of metal, there is the possibility of electrolytic action between the tube and the tank which may cause eventual corrosion through the steel tank itself.

SOLUTION: Pennsylvania Range Boiler Company has adopted a rigid Geon vinyl plastic tube for its line of automatic gas fired hot water heaters. Geon resin is a product of B. F. Goodrich Chemical Company.

RESULTS: A test program showed that pipe made from Geon resin had dimensional stability under normal operating conditions of the tank between 140 and 160F. During a standard AGA test in which the pipe is hung vertically in water, linear shrinkage was less than ½ inch.

Air Conditioning Aids Multi-Color Printing

PROBLEM: At a recent convention of printing craftsmen in Dallas, Dr. Paul J. Hartsuch, lithographic consultant with the Printing Ink Division of the Interchemical Corp., directed attention to the fact that variations of moisture have an adverse effect upon many printing processes. Variation of moisture in light sensitive coatings is the source of most plate-making troubles experienced in hot, humid weather. It can account for plate scumming on the press, as well as for failure of some image areas to take ink in deeply etched plates. Other factors affected by moisture are the drying rate of ink, wrinkling and stretching of paper, generation of static electricity, and comfort of employees.

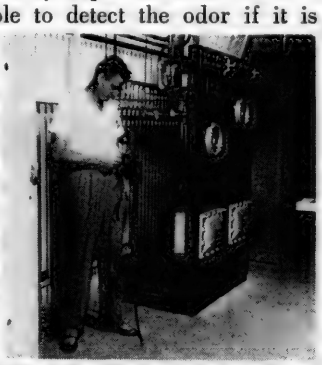


SOLUTION: Dr. Hartsuch reported that air conditioning has proved valuable in solving many of the production problems in fine-register, multi-color lithographic printing. He defined sufficient air conditioning as automatically controlling air at 75 to 80F with relative humidity at 45 to 50%. He added that the concept includes the addition of moisture to air during the dry months as well as refrigeration and dehumidification during the summer. Ralph Gonzales of Chrysler Airtemp observed that press room relative humidity range usually is given as 46 to 48%, with the stock storage room 5 to 8% above the press room.

RESULTS: Mr. Gonzales reported that many printing plants are obtaining excellent production results from installation of standard comfort air conditioning systems to handle summer problems. While humidity control maintained by comfort systems is not precisely within the limits set by paper and technical printing men, it is a major improvement over previous conditions. He pointed out that systems for exact temperature and humidity control may cost as much as double the amount of a comfort system and suggested that the quality improvement resulting from a comfort installation may be considered as a first step to which close control can be added at a later date.

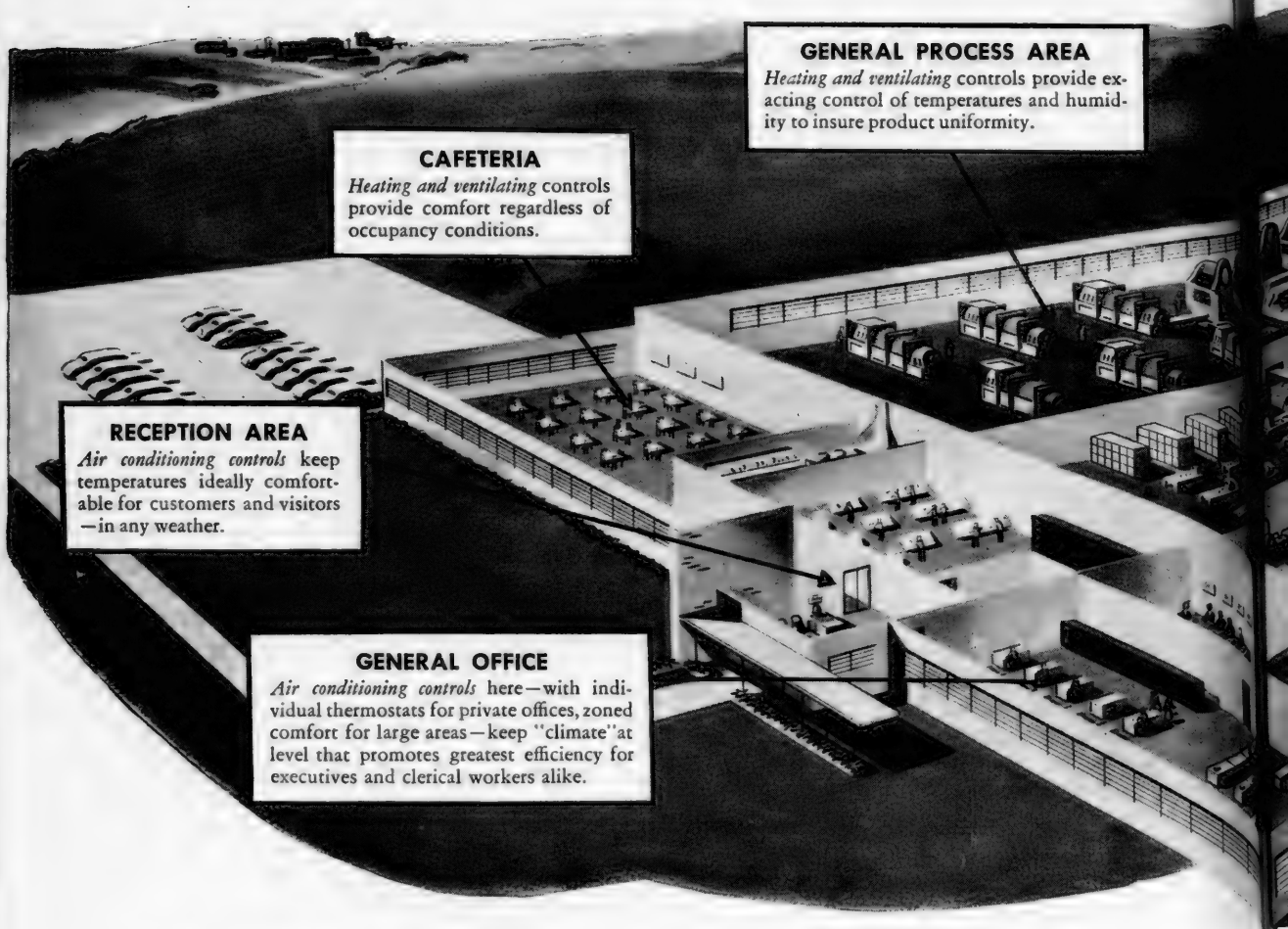
Mechanical Sniffers Promote Safety

PROBLEM: Employees of the development and testing laboratories at Northrop Aircraft, Inc., in Hawthorne, Calif., work constantly with large quantities of jet fuels. Safety precautions include intensive training and standby facilities for fire fighting and other emergencies. A weak spot in the program, now corrected, was the fact that the sense of smell is dulled by exposure to the fuel so that personnel are not able to detect the odor if it is encountered in the wrong places.



SOLUTION: A system of 16 mechanical sniffers now take a constant sample of the atmosphere in test pits and various other locations where hazardous concentrations of fumes may accumulate. The sampling apparatus is the MSA combustible gas alarm, product of Mine Safety Appliances Co. of Pittsburgh, Pa. If any sample contains as much as 40% of the amount required to support combustion, the instrument flashes a light showing the location of the hazard. Ventilating fans instantly go into action to disperse the vapors. If the percentage goes up to 60% of the L.C.L., a red light flashes on the alarm panel and green lights flash in all areas of the laboratory. Also, a horn sounds to warn employees and bring the fire department into action. Part of the system is an arrangement of activated platinum filaments which burn the undesirable gases in minimum concentrations to set off the alarm.

RESULTS: The safety program of a plant, where fuel fumes may go undetected by ordinary means, gets the assurance of positive warning when a hazardous situation develops.


GENERAL PROCESS AREA
Heating and ventilating controls provide exacting control of temperatures and humidity to insure product uniformity.
CAFETERIA
Heating and ventilating controls provide comfort regardless of occupancy conditions.
RECEPTION AREA
Air conditioning controls keep temperatures ideally comfortable for customers and visitors —in any weather.
GENERAL OFFICE
Air conditioning controls here—with individual thermostats for private offices, zoned comfort for large areas—keep "climate" at level that promotes greatest efficiency for executives and clerical workers alike.

How Honeywell Customized Temperature Control Can Raise Industrial Efficiency

Take two of the most important factors in business today: employee work-output and product quality.

There's good evidence that on both counts the efficiency of a plant could be considerably improved by proper installation of Honeywell Controls.

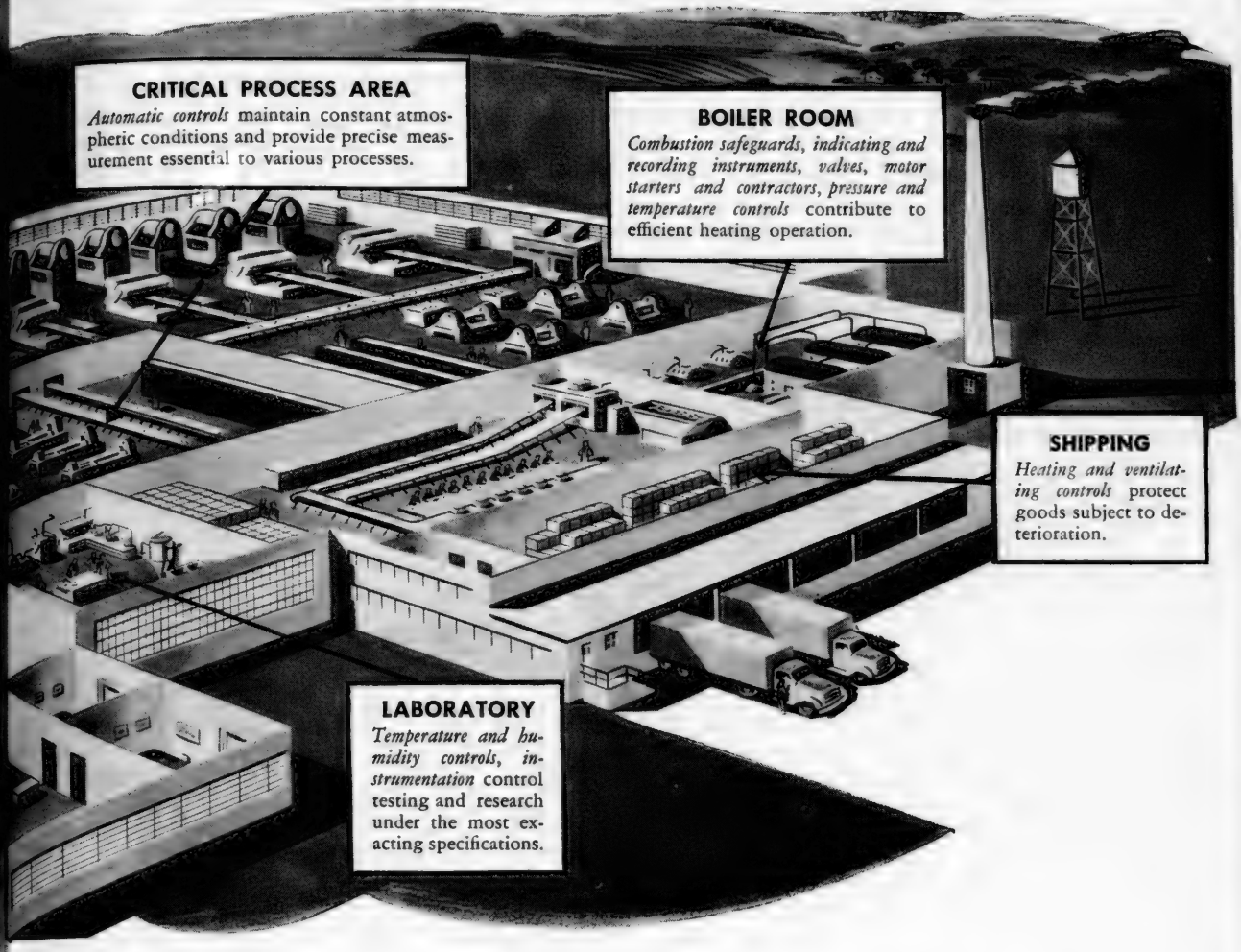
As for the amount of work employees do . . . scores of plants throughout the country have greatly boosted efficiency—by protecting workers' health, increasing their comfort, making them happier.

One of the primary ways this was done was through the use of Honeywell Customized Temperature Control installations in areas like those above. By compensating for such varying factors as weather, exposure, occupancy, internal heat sources and type of building construction, Honeywell Controls have greatly improved working conditions.

Or consider the realm of product quality . . .

Honeywell control installations in industrial centers have helped improve products, often have made possible a much greater degree of uniformity. These controls for temperature, humidity and process instrumentation are in daily use by industries as divergent as pickle packers and uranium processors, paper manufacturers and steel fabricators.

And in many cases, Honeywell Customized Control installations are saving businesses thousands of dollars yearly through more economical use of fuel.


CRITICAL PROCESS AREA
Automatic controls maintain constant atmospheric conditions and provide precise measurement essential to various processes.
BOILER ROOM
Combustion safeguards, indicating and recording instruments, valves, motor starters and contractors, pressure and temperature controls contribute to efficient heating operation.
SHIPPING
Heating and ventilating controls protect goods subject to deterioration.
LABORATORY
Temperature and humidity controls, instrumentation control testing and research under the most exacting specifications.

For Comfortable, Even Temperature in New or Existing Buildings—of any size—Use Honeywell Customized Temperature Control

Whether it's a factory, school, office, hospital, apartment, store, garage — or any size building — new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate" — and save fuel besides.

And with a complete line of pneumatic, electric and electronic controls to choose from, Honeywell Customized Temperature Control offers you the greatest flexibility in design. Then, too, when it comes to performance, Honeywell-built controls assure years of trouble-free operation. And they're backed by the finest service organization in the controls industry.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 112 across the nation. Or mail the coupon today.

MINNEAPOLIS
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First in Controls

112 OFFICES ACROSS THE NATION

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-5-58, Minneapolis 8, Minnesota

Gentlemen:

I'm interested in learning more about Honeywell Customized Temperature Control.

Name .....

Firm Name .....

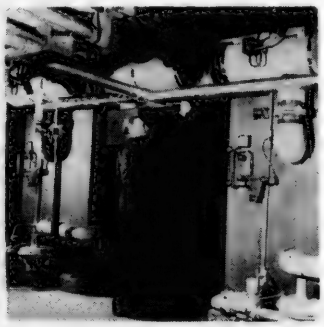
Address .....

City .....*Zone*....*State*.....

New Boilers Heat School

PROBLEM: Enlargement of the Arnold Avenue school in Port Allegany, Pa., presented a heating problem in the fact that the three coal-fired boilers which had been in service many years gave barely enough heat for the existing building, yet occupied all of the available space in the boiler room. A new boiler room would have added greatly to the cost of construction.

SOLUTION: Since existing boilers would have to be replaced in any event in the near future, the school board asked for installation of gas fired equipment of greater heating capacity in the same space. Natural gas of 1,180 Btu per cubic foot was available. Another factor influencing the choice of gas was the fact that the boiler room and stairway were so constructed that only gas fired sectional-type cast iron boilers could be installed without tearing away and rebuilding walls. Two new 66 series National gas boilers were installed, each consisting of twelve sections and having an output rating of 2,200,000 Btu per hour. Boilers are a recent development by the National Radiator Co. extending the size range of a design that has been widely used in three smaller sizes.



RESULTS: The two boilers when operating simultaneously are more than adequate for the building with its new addition and also provide flexibility in heating efficiently at off-peak loads. A Johnson control system gives independent temperature control to each room.

Bomb-Proof Vault Air Conditioned

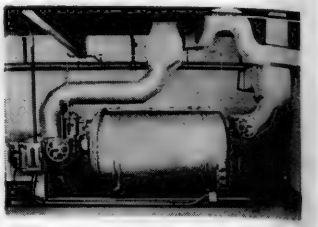
PROBLEM: Preparation of the nation's second biggest atom bomb-proof vault for private use required that underground air conditions be maintained within limits of temperature and humidity advantageous to the preservation of business records, art treasures, and microfilms placed there to be safe from destruction. The vault is being constructed in an abandoned Southern Pacific Railroad tunnel in the Santa Cruz mountain range in California. It is being built by Western States Atomic Vaults, Inc.

SOLUTION: A Carrier central system Weathermaker will be used to maintain the conditions required. Temperature will be held at 65F and relative humidity at 45% in the 24-ft tunnel containing 51,000 cu ft.

RESULTS: An air conditioned atom-bomb-proof vault including a fire protection system will preserve valuable records and films against attack or decay. Construction of this project will fulfill a dream envisioned by Jules Charboneau, collector of miniatures and chairman of the board of directors for the vault. The owners estimate it would cost $1 million to build a similar vault without an existing tunnel.

Solvent Recovery Controls Odors

PROBLEM: A serious condition existed in the plant of an Ohio decal manufacturer due to highly volatile lacquers and solvents used in making the transfers. The fumes cause nausea and dizziness among employees and conventional air conditioning was not able to offset the condition.



SOLUTION: To remove the irritating substances from the air, a Barnebey-Cheney solvent recovery system was installed. The system handles 4,000 cfm, from which it removes the noxious vapors and recirculates the air to work areas.

RESULTS: Although the basic problems was control of odor, the system recovered over 1,000 gallons of solvents every month. More pleasant working conditions resulted in an immediate increase of 45% in production.

Trencher Cuts Pipe Laying Time

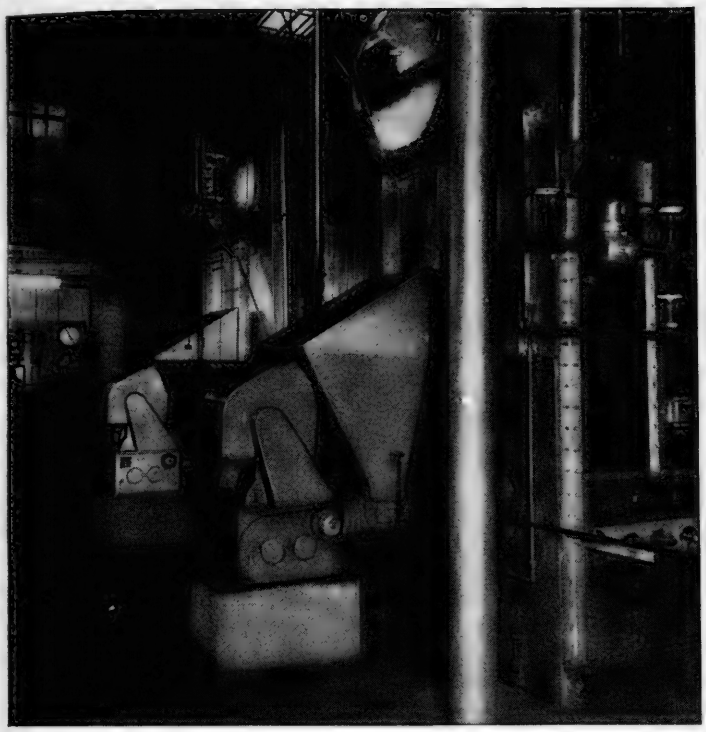
PROBLEM: Construction of four or five gas main extensions scattered around a major metropolitan area is an average day's work for crews operated by Hattendorf-Bliss, Inc., Cleveland, Ohio, pipeline contractors. Each job is a complete project including trench digging, pipe laying, trench backfill, and cleaning up. Each trench is 200 to 300 feet long and requires 10 to 20 miles of travel daily through big city traffic.

SOLUTION: Hattendorf-Bliss have standardized on Cleveland's trenches which are transported from job to job on low-boy trailers. Daily schedules are carefully laid out. On jobs where haulaway of spoil (earth left over after backfill) is required, trenchers discharge a preliminary shallow cut directly into dump trucks. Depth of the first cut is gaged by the size of the pipe to be buried. Trenchers then make a second cut to the full depth of the trench.

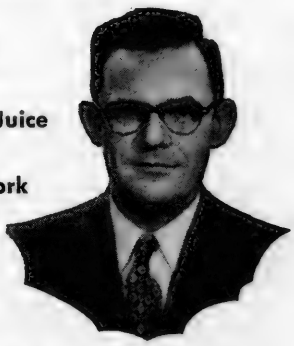
RESULTS: On the initial shallow cut, trenchers move very fast and conveyors are high above ground in best position for truck loading. There is no reason for concern about caving in when the trencher straddles the cut in making the final excavation to full depth. Schedules can be timed so that machines do not stand idle. When trucks are not hauling away spoil, they are busy hauling materials and supplies from job to job. On a typical 8-hour work day under adverse winter digging conditions, a crew with one Cleveland trencher completed four separate jobs at four separate locations. Trenches dug totaled 1,091 feet, and the distance traveled between jobs was 11 miles. In one 10-hour day a crew with one trencher dug 11,000 feet of trench 19 inches wide by 30 inches.

"WE GET BIG SAVINGS BY BURNING COAL THE MODERN WAY!

Other fuels would cost us far more!"



says
Mr. A. J. Monta,
Plants Engineer,
The Welch Grape Juice Company, Inc.,
Westfield, New York



"We analyzed the cost of coal and other fuels before modernizing our power plant. The result is this up-to-date coal installation that delivers steam at half the cost of competing fuels. *For economy you can't beat* bituminous *coal burned the modern way!*"

Modern coal-burning and handling equipment saves this plant more than 35% on labor alone! New stokers, boilers, controls and coal-handling equipment cut labor costs and save this plant 18% on fuel. The complete installation will pay for itself in about 6 years.

• Burning bituminous coal the modern way can save you money, too! Labor costs are cut to a minimum with up-to-date coal- and ash-handling equipment... modern combustion installations deliver anywhere from 10 to 40% more power from every ton of coal!

That's why, if you're planning to modernize or build a new plant, it will pay you to get the latest facts on coal. Let a consulting engineer show you how a modern coal installation designed to meet your specific needs can save you real money.

Here's something more! Today's bituminous coal customers get a better-prepared product—designed to meet their special requirements. And bituminous coal offers future dependability no other fuel can match. Reserves are virtually inexhaustible, and America's coal industry is the world's most efficient —your assurance of dependable supply of coal at relatively stable prices for years to come.

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—*for hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY ... FOR LOW COST

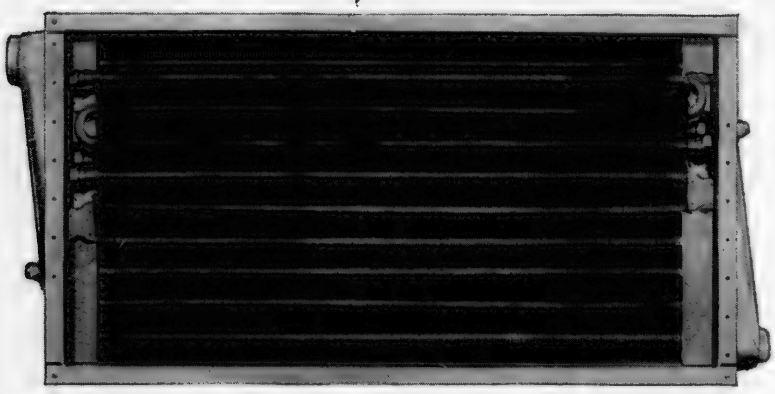
YOU CAN COUNT ON COAL!

We Make

Extended-Surface

HEAT EXCHANGERS

Exclusively!



The pioneer in the field, Aerofin has concentrated on one thing, *and one thing only* — highly efficient, easily installed, easily maintained extended-surface heat exchangers. Aerofin's design, research, engineering and production experience and facilities are unequalled anywhere.

For High Efficiency, Easy Installation, Low Maintenance and Servicing Costs . . .

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

AEROFIN CORPORATION

410 South Geddes St.
SYRACUSE, N. Y.

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Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**

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Enter the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

PACKAGE AIR CONDITIONER—Bulletin C-1100-B49 introduces the new package air conditioner offered by Worthington Corp., Harrison, N. J. According to the bulletin, the unit offers such features as nameplate concealed controls; lubricated-for-life fan, fan motor ball bearings and compressor; viscous type filter; and accessories that provide for all-directional air circulation and winter climate control. The bulletin illustrates parts and operation factors of the unit and gives dimensions and capacities.....Item 101

CALCULATING HP OF V-BELT DRIVES—A six-page Bulletin, 20B6956B, which provides in condensed form the new method of calculating the horsepower capacity of a Texrope V-belt drive, is issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis. The belt ratings resulting from this new method take into consideration effect of belt length, ratio of the diameters of both the driving and driven sheaves upon the horsepower rating of the belt, and resultant belt life. These are features which were not adequately reflected in the former V-belt horsepower ratings. The new formula provides means of determining the ratings for both standard construction and the company's high capacity V-belts. All sheave and V-belt manufacturers in the industry, it is said, have approved and accepted the belt horsepower ratings derived from this formula.....Item 102

MOTOR CONTROL SELECTION—The latest selection information on motor starters and push-buttons is contained in a new publication available from the General Electric Co., Schenectady, N. Y. Designated as GEA-6061, the six page bulletin provides buying information on a-c magnetic motor starters (1/6 to 50-hp), a-c combination starters (½ to 25-hp), push-button stations, a-c manual motor starters, and magnetic reversing controllers. In addition to rating and suggested prices, the publication contains photos of the equipment, circuit diagrams, and brief application data.....Item 103

AIR CONDITIONING—REFRIGERATION—A condensed air conditioning-refrigeration catalog is distributed by A-P Controls Corp., Milwaukee, Wis. Completely redesigned, this catalog furnishes up-to-date information about the company's line of valves, filters and driers for the air conditioning and refrigeration industry. Complete product specifications, charts, how-to-select information and sales data are provided. New products, improved designs and product model number changes are illustrated and listed in this new release.....Item 104

FACTORY-ASSEMBLED POWER PLANTS—A 16-page illustrated catalog, SB-51, on factory-assembled water tube steam generators is issued to industry by the Erie City Iron Works, Erie, Penna. The book shows in detail production methods and materials employed in the fabrication and assembly of Keystone steam generators within the company's plant. It contains important information concerning characteristics of the generators and specifications of all materials furnished, including accessories.....Item 105

BIMETAL DISC THERMOSTATS—Illustrated bulletin L-9070, on Stemco Type A bimetal disc thermostats, is distributed by Stevens Mfg. Co., Inc., Mansfield, Ohio. Semi-enclosed and hermetically sealed styles are covered. The bulletin gives suggested applications, and describes the operating principle, which it illustrates with a schematic diagram. It also gives performance data, dimensions, construction details and ratings. Various mounting arrangements are illustrated with photographs.....Item 106

LEVEL AND PRESSURE CONTROL—Chronoflo Level and Pressure Telemeter, Bulletin 230-K10 of Builders-Providence, Inc., Providence, R. I., describes the application of Chronoflo telemetering to level control in reservoirs and elevated and ground storage; to pressure control in pump discharge lines, distribution systems, booster stations, industrial processes, steam and gas lines; and to automatic pump control. This 8-page bulletin includes features, description and illustrations of the transmitters and receivers, and diagrams of installation arrangements, together with explanatory material on application and other features.....Item 107

FINNED RADIATION AND COVERS—A 12-page illustrated color bulletin describing its line of finned radiation and covers for commercial, industrial and institutional heating is issued by Rush Mfg. Co., West Hartford, Conn. Included in the new bulletin is information on the 4¼- x 4¼-inch fin on 1¼- and 2-inch steel tube that has recently been added to the company's line of finned radiation.....Item 108

HEATING AND AIR CONDITIONING SPECIALTIES—The heating and air conditioning specialties of Mald-O'-Rist, Inc., Chicago, Ill., are covered in its 11-page general catalog. Items described and illustrated are automatic air valves for hot water heating systems, automatic humidifiers for warm air furnaces, automatic humidifiers for steam and hot water, balancing fittings, water line float control valves, and water line controls.....Item 109

WELDLESS ROLLED RINGS—Eight ways to improve product design through use of weldless rolled rings are explained in a new folder by Ladish Co., Cudahy, Wis. Described and illustrated are rings in sizes up to 240 inches and weights up to 40,000 lb. They are available in square, rectangular and contoured cross sections. Advantages are concisely presented with typical applications that include such items as rotary kilns and driers, ring gears, heat exchangers and vessels.....Item 110

FORCED AIR FURNACE—An information piece is available on the Tall Red forced-air furnace of Royal Jet, Inc., Alhambra, Calif. The attractive pamphlet describes the features of the heating unit and includes technical data.....Item 111

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AUTOMATIC ANTHRACITE EQUIPMENT FOR THE HOME—A new booklet, Automatic Anthracite Equipment For The Home, is available at the Anthracite Information Bureau, New York, N. Y. This 40-page illustrated handbook describes automatic vacuum ash removal systems, the application of year-round air conditioning systems with automatic hard coal units, and all types of modern automatic anthracite warm air and radiator heating systems for the home.....Item 146

GAS REGULATORS—The complete line of gas regulators of Air Reduction Sales Co., New York, N. Y., is fully described in a 36-page catalog. Cylinder, manifold, and pipeline regulators are illustrated with complete description covering specifications and operating data. Also included are flow and pressure charts indicating at what point the regulators can be used to perform a particular job.....Item 147

FLOW CONTROL OF GASES AND LIQUIDS—Thermomatic, automatic, manual and thermostatic temperature controls for oils, gases, liquids and refrigerants are concisely summarized in a 4-page catalog for heating and cooling engineers, manufacturers or designers, issued by A-P Controls Corp., Milwaukee, Wis. Illustrated and briefly outlined with description of application, capacity data, and outlet sizes is the single-unit Gasspack line for natural, manufactured or L.P. gas; oil flow control valves for space heaters or furnaces and gravity-fed oil burners; and thermostatic accessories.....Item 148

ELECTRONIC TEMPERATURE CONTROL—A bulletin is available on the electronic temperature control, Series 97, manufactured by Robertshaw-Fulton Controls Co., Philadelphia, Pa. The control is used in production processes for electric, steam and hot water heaters; baths of all kinds; ovens, kilns and dryers; plastic extrusion presses, and has other uses, according to the company. It operates on the principle that change of resistance of a wire-wound sensing element changes with the temperature.....Item 149

ELECTRIC RADIANT HEATERS—High speed drying and curing of synthetic textile finishes by means of far-infrared radiation is covered in a new 22-page illustrated folder entitled The Textile Report, published by Edwin L. Wiegand Co., Pittsburgh, Pa. This report illustrates typical tenter frame installations, using electric radiant heat for both drying and curing of synthetic resin impregnations. According to the folder, the long wavelength radiation of far-infrared installations is accurately adjustable with vernier control to duplicate curing and drying results for any weight, speed, or width of material. The far-infrared radiant heaters are all metal, self-supporting, and are undamaged by moisture or mechanical vibration, according to the textile report, which illustrates successful installations of recent years in this growing field.....Item 150

REGISTERS, GRILLES, AND ACCESSORIES—A 16-page catalog describing the 14 categories of the line of General Register Corp., Cedar Grove, N. J., is made available by the company. It presents a wide range of registers fabricated of hollow rolled metal sections, assembled in welded rectangular frames. Also included are stamped plain lattice and ventilating grilles. A feature of all types of registers, according to the literature, is the company's Silentite volume damper of the opposed action valve type, with streamlined blades of hollow-ribbed construction. Accessories include duct air directors, adjusting keys, mounting frames, and fusible links.....Item 151

PYROMETERS—Bulletin 471 issued by Illinois Testing Laboratories, Inc., Chicago, Ill., describes its Alnor Series A, R, and E pyrometers. Series A pyrometers are said to be best for rugged service and can be mounted on a diesel or other equipment subject to vibration or rough treatment. Series R are best for all-purpose service and general industrial use, and Series E pyrometers are said to be best for easy reading, are sensitive and are recommended for heat-treating furnaces and similar stationary uses. A page is devoted to explaining the functioning of a pyrometer, and an interesting comparision is made between a pyrometer and a d-c motor.....Item 152

PREHEATING COMBUSTION AIR—The Ljungstrom Air Preheater, a 36-page booklet available from Air Preheater Corp., New York, N. Y., explains the fuel savings and increased performance made possible by using waste heat in flue gasses to preheat incoming combustion air. The booklet contrasts regenerative with recuperative preheaters, and explains the operating principle and structural details and advantages of the company's air preheater, a gas-to-gas preheater of the continuous regenerative type. Industrial applications for other than power boilers are covered, and several pages of layout drawings, showing typical preheater arrangements on many different types and sizes of boilers are included.....Item 153

TEMPERATURE REGULATORS—A four-page bulletin describing design and operation features of its temperature regulators is issued by Spence Engineering Co., Inc., Walden, N. Y. According to the bulletin, a single pilot, combining both a pressure and thermal element, changes steam pressure for delivery according to demand requirements. A large cutaway diagram of Type ET150 temperature regulator is shown with a description of construction and parts. Recommended installations of the regulators for instantaneous water heaters, storage water heaters and forced air heating systems are shown in three line drawings.....Item 154

WATER PUMPS, SYSTEMS AND SOFTENERS—A multicolored, illustrated 38-page catalog, No. 54, is issued by the Duro Co., Dayton, Ohio, to describe the company's water pumps, water systems, water softeners and filters. Typical applications and performance charts are included, together with ejectors, well cylinders and accessories. .....Item 155

DUAL FUEL ENGINE—Bulletin S-300-B57 on dual fuel engines for generating stations, sewage disposal, private utility, municipal power, pipeline pumping, industrial power, and irrigation and drainage, is announced by Worthington Corp., Harrison, N. J. In the 36-page book are photographs of each application, together with vital statistics, case histories and other data.....Item 156

CHIMNEY HOUSING—Available on request from Van-Packer Corp., Chicago, Ill., is the 4-page folder on the company's packaged masonry safety chimney with brick-panel housing. This two-color brochure tells how the chimney can provide masonry chimney construction at a 30 to 50 per cent saving, while retaining conventional brick chimney appearance. It contains pictures and captions that explain installation procedure, photos of the company's chimney housing on different types of homes and a cutaway view of the completed chimney.....Item 157

HEATING AND COOLING EQUIPMENT—The heating and cooling equipment of The Coleman Co., Wichita, Kans., is listed in a 32-page catalog. The company's complete heating system, called the Blend-Aire, is a small-pipe system composed of the furnace, blower, fittings and blenders, conceived as a single unit. The company's gas and oil furnaces are described in the bulletin, as well as the packaged remote air conditioning system and the self-contained conditioner. Gas and oil floor heaters, gas wall heaters, oil and gas water heaters, all have sections devoted to their features and functions.....Item 158

HEAT EXCHANGERS—Bulletin No. 23 issued by Niagara Blower Co., New York, N. Y., describes the operations of the Acro heat exchangers used in cooling or controlling temperatures of industrial liquids. It shows the operation of this equipment by means of diagrams and examples of application by photographs.....Item 159

PRODUCTS FOR HOT WATER AND STEAM SPACE HEATING SYSTEMS—Catalog Folder No. 54A of Watts Regulator Co., Lawrence, Mass., describes the company's products for domestic hot water supply heating systems and hot water and steam space heating systems, such as water tempering, vacumm relief, pressure relief, and other valves; siphon vacuum breakers; pressure regulators and strainers; steam boiler water level controls; and hot water heating specialties.....Item 160

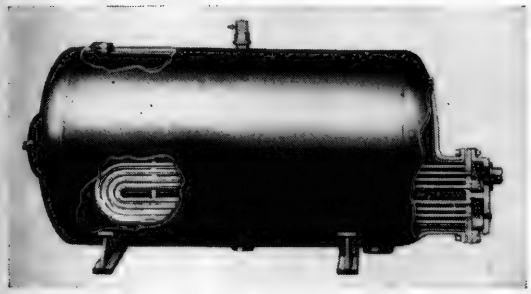
THREE V-BELT SLIDEFILMS—The second group in a series of educational 35mm sound slidefilms for industry is available through Allis-Chalmers Mfg. Co., Milwaukee, Wis. The three slidefilms are on the subject of v-belt drives, each runs about 20 minutes. They are titled In Every V-Belt Drive, For Better Driving, and Selecting a Drive.....Item 161

PRESSURE REGULATING AND RELIEF VALVES—The 23-page Catalog 207 issued by Schade Valve Mfg. Co., Philadelphia, Pa., is concerned with valve selection of the proper company valve and describes its pressure regulating valves, as well as relief valves and other of the company's products.....Item 162

HEATING CONTROLS—A 12-page bulletin, designated GEA-6118, on simplified heating controls for all oil burners, is issued by General Electric Co., Schenectady, N. Y. For oil burner dealers and servicemen, the two-color publication includes step-by-step installation photographs on the complete line of the company's oil burner controls. It provides information on the company's heating control exchange plan, an introductory offer by which dealers can turn in inoperative controls of any make.....Item 163

RATCHET-LEVER HOIST—A new 8-page bulletin, designated SP, on Safety-Pull ratchet-lever hoists is available from Coffing Hoist Co., Danville, Ill. It describes the entire line of ratchet-lever hoists, including both roller and coil-chain models with capacities ranging from ¾- to 15-ton. In addition to features, specifications, and special hooks, the bulletin illustrates the ratchet-pawl construction that eliminates friction brakes and the quick-disassembly feature of the coil-chain hoists. Action pictures of variou hoist uses complete the information .....Item 164

p-k warms your "Week-end at the Waldorf"



p-k copper-lined hot water storage heaters at the Waldorf

Travellers from all over the world enjoy luxury living at the famous Waldorf-Astoria Hotel on New York's Park Avenue.

Contributing to this luxury is a dependable source of clean hot water—enough for a town of 10,000 people who fill the Waldorf's 2200 guest rooms and public halls. Abundant, pure, rust-free hot water is always on tap direct from p-k *copper-lined* hot water storage heaters.

These heaters are really two heaters in one. Inside a heavy steel shell is a complete copper heater. Thus all the non-corrosive and durable qualities of copper are combined with the superior strength of steel. Water touches only non-rusting copper.

Consider your own hot water needs. p-k copper-lined hot water heaters are economical in first cost because of their unique design, outlast ordinary heaters and require the minimum in maintenance. p-k's 73 years of experience gives you two things — a satisfactory product and a sound guarantee. Why not learn more about p-k copper-lined heaters.

Full information and engineering help is yours for the asking.

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NEWS OF THE MONTH

ATOMIC POWER PLANT

proposal by Duquesne Light Co. gets nod from AEC. Government costs to be reduced by $30 million.

Lewis L. Strauss, chairman of the Atomic Energy Commission, announced in mid-March that a proposal submitted for participation by the Duquesne Light Company of Pittsburgh, Pa., in the construction and operation of the Nation's first full-scale central station nuclear power plant is the most favorable to the Government and that the AEC is negotiating a formal agreement with the company. The Duquesne Company submitted one of nine major proposals to the Commission.

• **PROPOSAL.**—Under the Duquesne proposal the company would:

(1) Furnish a site for the entire project and build and operate a new electric generating plant at no cost to the Government.
(2) Operate the reactor part of the plant and bear the labor costs thus entailed.
(3) Assume $5 million of the cost of research, development, and construction of the reactor portion of the plant.
(4) Pay the Commission at the rate of 48.3 cents per million Btu of steam used in the turbines for the first year; the rate increasing annually until it reaches 60.3 cents in the fifth year.
(5) Waive any reimbursement by the Government of costs incident to termination of the contract.

The chairman estimated that, including revenues from the sale of steam generated by the reactor, the company's proposal would reduce by an estimated $30 million the expenditures the Government would have to make during the period of construction and five years of operations if it undertook the full cost of the project.

The proposed plant site is on land presently owned by the company in the Greater Pittsburgh Area. The reactor design will incorporate safety features developed through ten years of experience with reactor operation.

The Westinghouse Electric Corp. has a contract with AEC to develop, design, and construct the reactor portion of the plant. The reactor is expected to generate sufficient heat to produce a minimum of 60,000 kilowatts of saleable electricity in addition to meeting the electricity requirements of the plant itself. The actual capacity of the reactor may turn out to be somewhat greater than the minimum of 60,000 kilowatts design and foreseeing this possibility the company would design its generating plant with some reserve capacity.

It is not expected that this first plant will produce electric power at costs competitive with power from conventional fuels. The project has been undertaken, in order to gain more design and technological experience than could be obtained otherwise, such as from a smaller plant, and to provide firm cost estimates for the future.

• **WATER-COOLED.**—This type of reactor, known as the Pressurized Water Reactor (PWR), will be cooled and moderated by ordinary water under pressure. The fuel will be slightly enriched uranium, that is, it will have a slightly greater concentration of uranium 235 than occurs in nature. This type of reactor was selected because research and development on it is more advanced than on other types. Several early reactors were water cooled and this technology also was advanced to a very great extent by the work of Westinghouse on the Submarine Thermal Reactor developed to power the submarine *Nautilus* and on the large naval vessel reactor project.

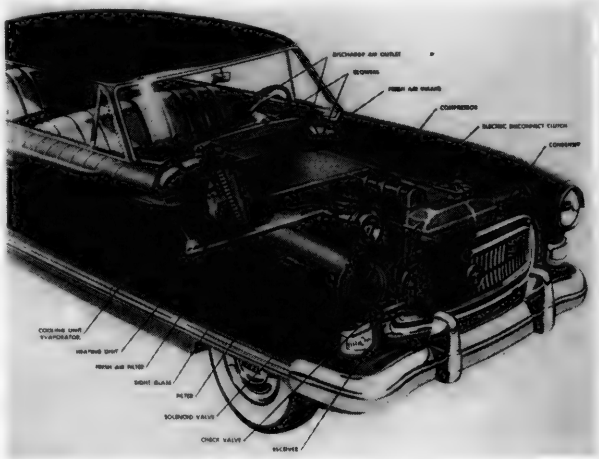
The Duquesne Light Company supplies electric power to the Greater Pittsburgh District, one of the world's largest industrial centers. Since last October the company has engaged in nuclear power reactor studies under the AEC's Industrial Participation Program. Preceding its entry into this study, the company arranged to have some 40 of its engineers attend a special course on atomic energy at the Carnegie Institute of Technology.

NASH AIR COOLER

combined with heater in single, forward-mounted unit for year-'round comfort conditioning.

Nash Motors has announced the All-Weather Eye air conditioning system for its passenger cars, in which, for the first time, cooling, heating and ventilating have been combined into a single integrated air conditioning unit operated with one simple thermostatic control. While pricing has not been completed, company officials say it will be low by present standards in the industry.

• **SIMPLE.**—The All-Weather Eye system is a self-contained unit, with all components located forward of the instrument panel. No components are placed in the trunk compartment.



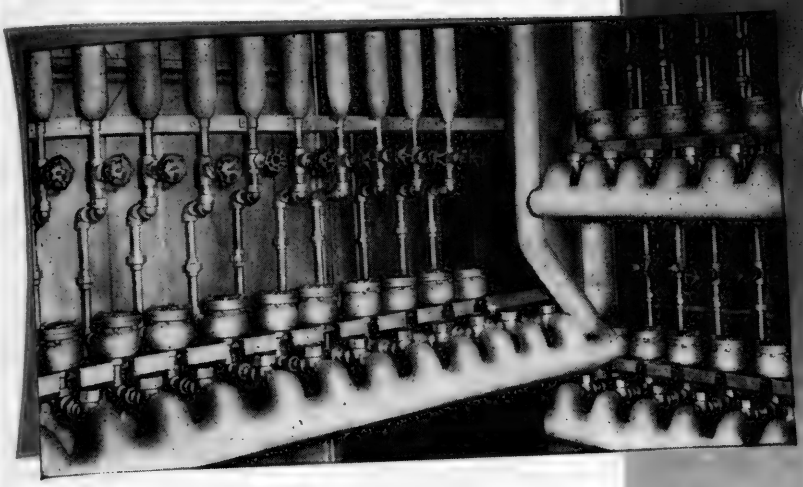
The new system has been developed around the Nash Weather Eye heating and ventilating system through the combined efforts of Nash and Kelvinator.

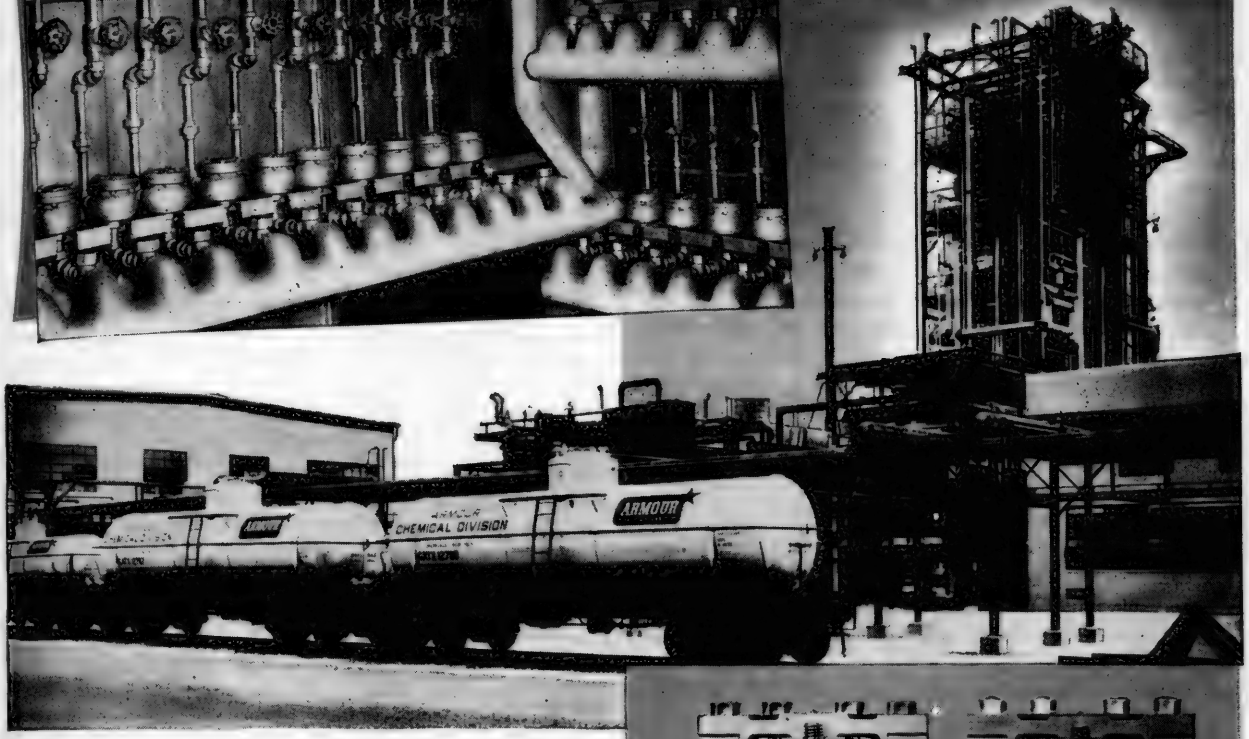
An outstanding feature is the single knob control for operating both the cooling and heating units. Major components of the air conditioning system include a com-

(*Continued on page* 138)

NICHOLSON TRAPS SELECTED

for Armour Chemical Plant





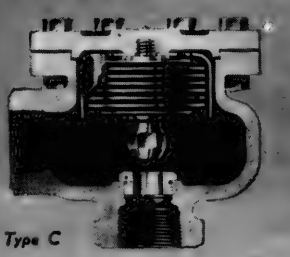
Above, new McCook, Ill., plant of Armour and Company's Chemical Division. Nicholson steam traps were specified throughout. Left above, a battery shown on tracer lines warming fatty acids.

Many chemicals are made available in commercial quantities for the first time by this new Armour Chemical Division plant. With demands for process steam alone as high as 80,000 pounds per hour, the entire plant is equipped with Nicholson steam traps, both grounds and buildings.

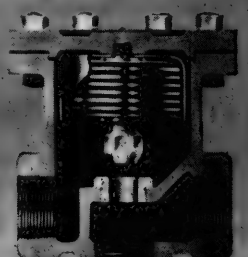
Features of Nicholson thermostatic steam traps: 2 to 6 times average drainage capacity; shorten heat-up time. Operate at lower temperature differential; fast action keeps equipment full of live steam. Maximum air-venting capacity. Freeze-proof. Types for every process, power, heat application.

Send for NICHOLSON TRAP CATALOG 953

Catalog 953 contains capacity tables, installation diagrams, and data, charts and formulae for determining the proper size trap.

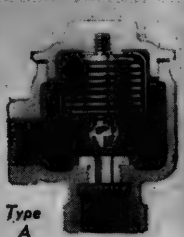


Type C

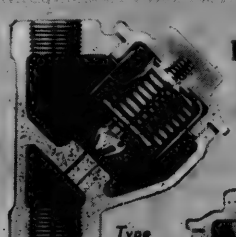


Type B

The two types above are semi-steel; sizes ½" to 2"; pressures from vacuum to 250 lbs. Type C also in cast steel for pressures to 300 lbs.

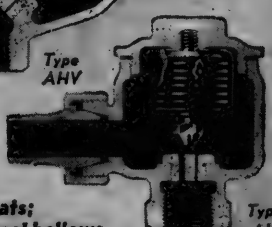


Type A



Type AHV

FIVE TYPES FOR EVERY PLANT USE



Type AU

These three types are bronze; sizes ¼" to 1"; pressures from vacuum to 200 lbs. All 5 types have stainless steel valves and seats; bronze, monel or stainless steel bellows.

W. H. NICHOLSON & CO.

199 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 57 Cities

NASH AIR COOLER

(*Continued from page* 136)

pressor, condenser, receiver, evaporator, and means of refrigerant flow control. An electric clutch disconnects the compressor when not in operation.

• **OPERATION.**—The cooling system is turned on by pushing the All-Weather Eye knob to the far left position, and then rotating it counter-clockwise to the "high" or "low" position. This starts the operating of the cooling cycle, and actuates the two blowers which discharge cool air into the passenger compartment. Two large deflectors over the discharge louvers on the cowl are raised to the full open position and the fresh air intake is open. No further adjustments are required.

In operation, fresh air enters the intake, passes over a baffle to remove rain water, and is then directed through a filter which removes dust and pollen. Air from within the car is drawn in from below the instrument panel and is intermixed with outside air as it passes into the cooling unit. About 30 percent of the volume of air entering the cooler is from the outside. The air then passes through the cooling unit and is forced by two high-capacity blowers to the two outlets located on the instrument panel. The outlet deflectors are designed to direct the cool air upwards in order to obtain a natural circulation of cool air from front to rear at the top. The air returns under and alongside the seats.

The heating system is operated by moving the All-Weather Eye knob to the right. The desired temperature is thermostatically maintained at all times. The heating system utilizes 100 percent outside air.

WATERPROOF INSULATION

developed by trade association offers new form of 85% Magnesia for hot piping and equipment.

Development of a new water resistant insulation for hot piping and equipment has been announced by The Magnesia Insulation Manufacturers Association. Tests by an independent laboratory indicate that immersion in boiling water for 378 hours with intermittent drying on hot pipes caused only a slight roughening of the insulation surface with no loss of insulating values. The new form of 85% Magnesia insulation was developed under sponsorship of the technical committee of the association and is the result of several years of research and development in laboratories and plants of member companies.

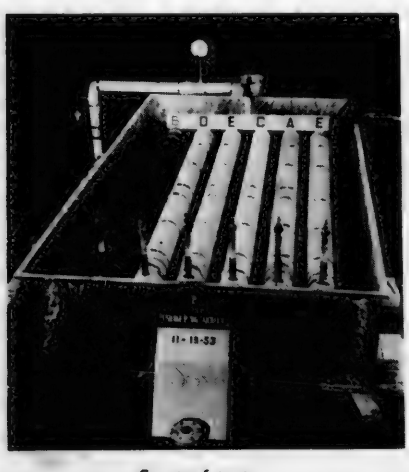
• **USES.**—The new insulating material is said to be especially useful for underground pipe lines subject to flooding, process equipment and piping requiring hosing or washing down, and similar conditions.

For all practical purposes, the water repellent additive in the new material does not affect the conductivity, density or other vital properties of the insulation. Conventional insulation, the association advises, will continue to be the industry's standard product.

• **TESTS.**—In tests conducted by the Pittsburgh Testing Laboratory, water resistant 85% Magnesia on hot steam pipes was subjected to 30 cycles of immersion in boiling water, each cycle consisting of seven hours immersion and 17 hours drying, plus an additional 168 consecutive hours of immersion. After each immersion, the steam pipes carrying 125 to 140 psig steam dried the insulation thoroughly. Examination were made between cycles and at the conclusion of the tests for disintegration, cracking, spalling, shrinking or other damage.

At the end of the tests, the new water resistant insulation, according to the laboratory report, was found to be intact with surfaces rougher but with joints firm and in good condition, no appreciable shrinkage, and no swelling or cutting in of bands. The report stated that it "was found to be highly resistant to disintegration under test conditions of continuous steam flow while immersed in boiling water."

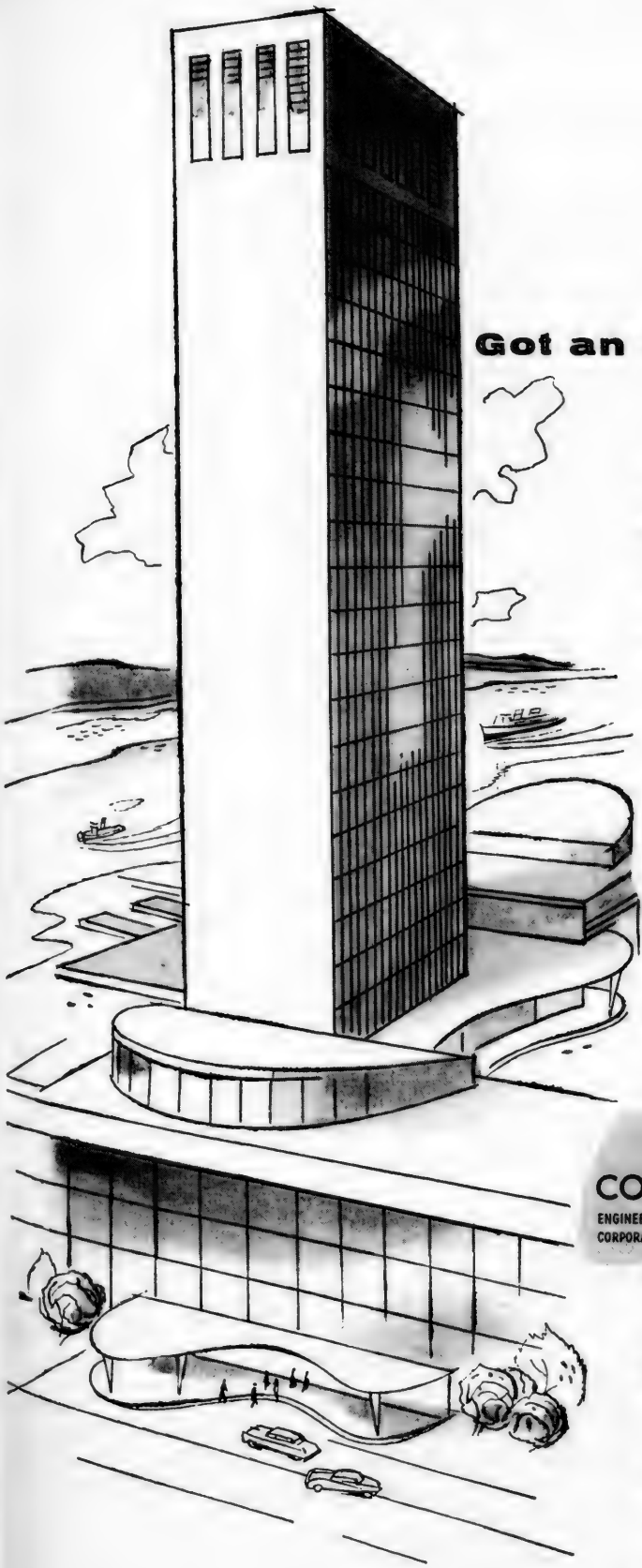
Since no standards exist for the measurement of insulation resistance to water damage, four other leading insulating materials were tested at the same time in the same equipment and under the same conditions. The laboratory report indicates that all four suffered severe damage within periods ranging from one hour to several cycles.



Start of test.

Pipes under boiling water.

Sample E survives.



Got an exhaust air problem?

In an air conditioned New York skyscraper the exhaust of washroom air presented a problem. Fortunately, the engineers could solve it effectively and economically by installing Dorex Air Recovery in the ventilating system.

Here, Dorex Air Recovery purifies 33,600 cubic feet of washroom air per minute so thoroughly that the air can be, and is, re-used in other parts of the building. This not only reduces the air conditioning load, but eliminates the need for two large ducts running up through 39 floors—an important saving in space as well as cost.

You can make Dorex Air Recovery a part of air conditioning and ventilating systems either new or old. The latter is particularly important because changed conditions within the building often create problems in ventilation that could not otherwise be solved except at great expense.

Dorex Air Recovery is backed by more than 20 years of experience and over 10,000 installations. Find out how it can benefit you. Mail the coupon today for full information. Connor Engineering Corporation, Danbury, Connecticut.

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Please send me, without obligation, complete information on Dorex Air Recovery.

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Company_____

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FUELS AND METALS

show improved supply and potential positions in report listing accomplishments of Mines Bureau.

The cooperation received from State mining officials, coal-mine management, and labor during the first year of operation under mandatory provisions of the new Federal Coal Mine Safety Act is emphasized in the annual report of the Bureau of Mines for the fiscal year ending June 30, 1953.

• **RESEARCH.**—Outstanding developments in other major Bureau programs highlighted in the report are:

(1) Perfection of a low-cost process for making ferronickel from low-grade domestic nickel-silicate ores and nickel metal from Cuban nickel oxide;

(2) Indication, by laboratory and small-scale pilot-plant tests, of the possibility of converting coal to highly aromatic gasoline by a single-step hydrogenation process;

(3) Laboratory-scale production of stable, high-octane gasoline by high-temperature retorting of entrained oil-shale particles;

(4) Production of more than 150 million cubic feet of helium—a new record;

(5) Improvement of methods for mining thick, steeply pitching anthracite beds, and further successful experiments in longwall mining of bituminous coal with an imported coal planer;

(6) Invention of a method for using titanium-dioxide smoke to plug highly permeable sections in a petroleum reservoir. This allows gas injected in secondary recovery operations to pass through less permeable sections of the reservoir and results in recovery of heretofore unrecoverable oil.

• **SAFETY.**—The Federal Coal Mine Safety Act, approved early in the year, directs the Bureau of Mines to enforce specific provisions designed to prevent disasters in mines regularly employing 15 men or more underground, while continuing to seek voluntary compliance with other safety standards in these mines. Over 6,000 regular and check inspections of mines subject to the act's mandatory provisions were made during the year, but only 50 mines were affected by orders requiring withdrawal of men. Such orders are issued when an inspector finds imminent danger of disaster or failure to correct previously noted violations of the law within a specified time.

One major coal-mine disaster occurred during the year, according to the report. A coal-dust explosion causing five deaths was set off by black blasting powder at a mine that had obtained an injunction against a Bureau withdrawal order. The disaster happened the day before the Bureau learned that the injunction had been dismissed.

• **METALS.**—Intensifying work on strategic metals and minerals, the Bureau investigated deposits of iron ore, manganese, molydenum, tungsten, thorium, and uranium and conducted research on aluminum, chromium, copper, lead, and zinc. It developed methods of recovering beryllium ores from domestic deposits, sought ways to increase supplies of columbium and tantalum, and furnished the Nation's entire supply of metallic zirconium and hafnium. To help meet defense needs, the Bureau resumed production of ductile titanium.

Looking for ways to use the Nation's plentiful low-grade ores, the Bureau perfected a method of agglomerating slime concentrates into a suitable furnace product. Known reserves of iron ore were increased through investigations in the Birmingham Basin of Alabama and the Klukwan deposit in Alaska.

Research on recovering valuable metals from scrap advanced rapidly; a vacuum-leaching method was devised to recover aluminum from scrap alloys or from certain primary raw materials. Experiments continued on synthetic mica, mullite, and block talc.

• **FUELS.**—Having shown that both coal hydrogenation and gas synthesis are practicable methods of producing synthetic liquid fuels from coal, the Bureau shut down its demonstration plants at Louisiana, Mo., at the end of the fiscal year. Meanwhile, experiments with improved catalysts at Bruceton, Pa., showed the possibility of developing a single-phase hydrogenation process to supplant the two-phase one used at Louisiana. Also, research at the Morgantown, W. Va., laboratories indicated that the cost of producing synthesis gas—carbon monoxide and hydrogen—might be reduced by gasifying coal under pressure.

Continuous gas-combustion retorting of oil shale began on a scale of 300 tons per day at Rifle, Colo. Also at Rifle, shale-mining methods were improved. Laboratory experiments at Laramie, Wyo., showed that high-temperature retorting of entrained oil-shale particles promises high shale throughput, flexible operation, and high-quality products.

Besides further experiments with an imported coal planer, Bureau coal research included comparative studies of several American continuous-mining machines. Determination of known minable coking coal continued in five States, and data were collected and published on the preparation and carbonizing properties of various coals.

A commercial fluidized-bed lignite drier developed by the Bureau in cooperation with a Texas power company was improved during the year, and design of the first fluidized carbonizer was completed.

A cooperative field study of radioactive minerals in Colorado also yielded information of value to the petroleum industry. Data were compiled on oil fields in the Missouri River Basin, and reports were published on petroleum-engineering and secondary-recovery studies in key oil fields in seven States.

PHILADELPHIA AIR

gets cleanup signal as Mayor Clark signs new air pollution control ordinance.

Philadelphia's new Air Pollution Control Ordinance was signed by Mayor Joseph S. Clark, Jr., March 9 at City Hall before members of City Council who sponsored it and a host of civic and industrial leaders who helped frame it.

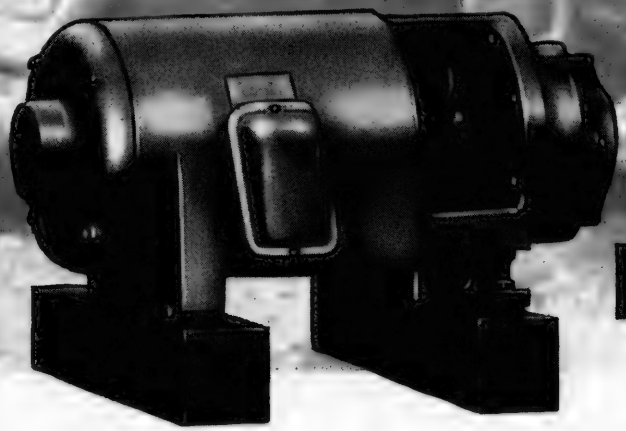
The new ordinance is stronger than its predecessor. It makes specific definitions of air pollution types and the air pollution nuisance to health and well-being and makes

(*Continued on page* 142)

ALLIS-CHALMERS

Air Conditioning PUMPS

Pre-Engineered to Save Time... INCREASE PROFITS FOR YOU!



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Allis-Chalmers engineers have wide experience in applying air conditioning pumps. Because they have a complete range of types and sizes to choose from, they can help you select the exact pump you need for dependable performance at lowest possible cost. Allis-Chalmers engineers can often suggest changes in your installation that will make it simpler and more satisfactory. And, when you use Allis-Chalmers equipment, you have *one reliable guarantee* for the complete pump and motor unit.

SAVE ON INSTALLATION TIME, TOO

Bolt it down, hook up the power, ground and piping, and your Allis-Chalmers pump is ready to go. There's no alignment problem. Correct installation is a big factor in pump performance and your Allis-Chalmers representative will help you here, too.

For Application Help, call your nearby Allis-Chalmers District Office. For more information about Allis-Chalmers air conditioning pumps, write for bulletins 52B7529, 52B6140, 52B6083 or 52B6975. Allis-Chalmers, Milwaukee 1, Wisconsin.

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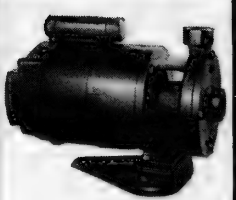

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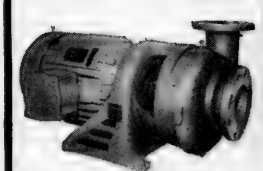
***ELECTRIFUGAL* PUMP**
A close-coupled pump with either conventional packing or mechanical seal. BULLETIN 52B6140



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Flange motor and pump on sturdy supporting adapter. With conventional packing or mechanical seal. BULLETIN 52B6083

VERTICAL MOUNTED PUMP
Mechanical seal or sealless units with choice of submerged or sidewall mounting. BULLETIN 52B6975

ALLIS-CHALMERS

PHILADELPHIA AIR

(*Continued from page* 140)

provisions for the important problem of controlling odors. In addition, it defines equipment covered by the ordinance, prescribes fees for permits, calls for an increase in penalties for violators and gives the city's Department of Health and the Air Pollution Control Board stronger enforcement and administrative powers.

• **ORGANIZATION.**— Under the new ordinance, the Department of Health's Air Pollution Control Division will administer and regulate, while the Air Pollution Control Board will serve in an advisory capacity. The Air Pollution Control Board is comprised of the city's health commissioner, an executive director and seven outstanding civic leaders who are appointed by the mayor and serve without compensation.

S. Charles Rothmann, recently-appointed director of the Air Pollution Control Division, points out the Division's program will continue to emphasize (1) elimination of open dump burning when incinerators are completed; (2) increased industrial cleanup activities, and (3) an automatic and fair enforcement policy.

Mr. Rothmann, an industrial engineer of 20 years' experience, came to Philadelphia in January from the University of California at Los Angeles, where he served as industrial hygiene engineer responsible for engineering control of atmospheric contaminants for four campuses, research centers and field stations. During World War II, he was a major and commanded several research centers and the Army's Industrial Hygiene Laboratory at John Hopkins University in Baltimore. He is a native of Charleston, W. Va.

NATURAL GAS RESERVES

show record increase in 1953 as exploration is stepped up. Oil reserves also increase.

Proved recoverable natural gas reserves in the United States on December 31, 1953, totaled 211.4 trillion cubic feet, an increase of 11.7 trillion cubic feet over reserves of a year earlier, it was announced in a joint report of the Committee on Reserves of the American Gas Association and the American Petroleum Institute. This was the largest increase in proved recoverable reserves since 1946 and occurred after an all-time high production of 9.2 trillion cubic feet of natural gas used in 1953. The previous record production was 8.6 trillion cubic feet of natural gas in 1952.

• **LIQUID.**—The A.G.A. Committee on Natural Gas Reserves estimated proved recoverable reserves of natural gas liquids on December 31, 1953, also had risen to a record level of 5.4 billion barrels. This compares with a previous high of 5.0 billion barrels at the end of 1952. This increase was registered despite a record production of 303 million barrels of natural gas liquids last year.

Crude oil reserves on December 31, 1953, totaled approximately 28.9 billion barrels, compared with 28.0 billion barrels at the end of 1952. The total estimated liquid hydrocarbon reserves on December 31, 1953, were 34.38 billion barrels, compared with 32.96 billion barrels a year earlier.

• **DISCOVERIES.**—The discovery of 7.1 trillion cubic feet of new natural gas reserves in 1953 as compared with 5.4 trillion cubic feet of reserves in new fields brought in during 1952, emphasizes the important increase in exploration activities resulting from the ever-increasing demand for natural gas. Further exploration and drilling in existing fields added another 13.4 trillion cubic feet to the nation's proved recoverable reserves of natural gas. Nearly 516 billion cubic feet of natural gas were added to estimated reserves in underground storage at the end of 1953.

CHICAGO DUSTFALL

for 1953 lowest on record at 53.6 tons per sq. mile. December loop average, 142 tons.

The year 1953 was Chicago's cleanest on record, according to scientists at Armour Research Foundation of Illinois Institute of Technology. The city's average monthly dustfall for the year was 53.61 tons per square mile, it was reported by William A. Dupraw, research analytical chemist at the Foundation.

This figure represented a significant reduction from the average of 56.07 tons per square mile in 1952, the city's next cleanest year since ARF first started measuring and analyzing dustfall in 1946.

• **WEATHER.**—Mr. Dupraw said the 1953 dustfall was good because the weather for the year—especially the last few months—was relatively mild. December, for example, averaged only 55.94 tons per square, which is considered light for a winter month.

Dustfall is usually heaviest during the winter, he explained, because of the many heating fires in use. Other factors which affect dustfall are windy weather, which redeposits dirt and soot from one area to another; precipitation, which brings down the dust in the air; and air pollution caused by industrial, commercial and residential sources.

• **DECEMBER.**—As a public service Armour Research Foundation measures and analyzes Chicago's dustfall each month for the city department of air pollution control. Dustfall is recorded at 24 sampling Stations. Extreme readings during December, 1953, were: (High) At the Fair Store in the Loop, 169.5 tons per sq mile; (low) at 1620 W. 99th St., 24.2 tons per sq mile.

NDHA

to convene at White Sulphur Springs May 25-28; program includes technical reports and papers.

MANY interesting papers and reports are scheduled for the forty-fifth annual meeting of the National District Heating Association to be held at The Greenbrier,

(*Continued on page* 144)

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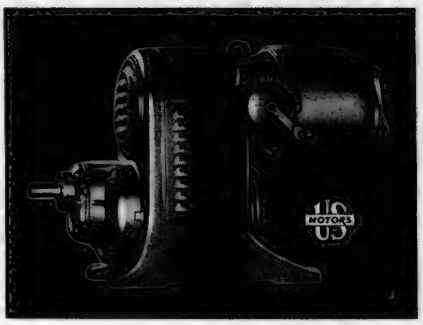

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NDHA

(*Continued from page* 142)

White Sulphur Springs, W. Va., May 25 to 28. Scheduled for Tuesday morning is the address by the president, Charles W. Deeg, Philadelphia Electric Company, Philadelphia, Pa., and a number of committee reports. In the afternoon there is the report of the Safety Committee by Peter Barry, Chairman, Rochester Gas and Electric Corporation, Rochester, N. Y., and one by the Distribution Committee of which Vernon J. Suche, Union Electric Company of Missouri, St. Louis, Mo., is Chairman.

• **STEAM LINE PRACTICE.**—The following papers are to be presented.

Survey to Locate Newly-Developed Materials Suitable for Main Construction, by John L. McKinley, Public Service Company of Colorado, Denver, Colo.

Steam-Main Construction Practices and Recent Improvements in Design, by Homer F. Hatfield and John F. West, Jr., Pennsylvania Power & Light Company, Allentown, Pa.

Prevailing Practices Regarding Design, Location, Operation, and Maintenance of Service Valves and Their Housings, by Ernest T. Smith, The Detroit Edison Company, Detroit, Mich.

Underground Steam Lines—Their Life Expectancy, by William E. Lucas, Allegheny County Steam Heating Company, Pittsburgh, Pa.

Construction of a Steam Feeder Line in Indianapolis—Movie. Walter A. Schulmeister. S. E. Dockstader, Inc., N. Tonawanda, N. Y.

Research on Underground Pipe Insulation, by David C. Goff, Zonolite Company, Chicago, Ill.

• **HEATING DESIGN.**—Scheduled for the afternoon are reports of the Steam Losses Committee, Robert C. Wilson, Chairman, Ohio Edison Company, Akron, Ohio; Commercial Relations Committee, Carl W. Signor, Chairman, The Detroit Edison Company, Detroit, Mich.; and the following papers:

Radiant Heating: Another Tool for the Heating Engineer, by William P. Chapman, Engineering Sales Service Representative, National Tube Division, United States Steel Corporation, Pittsburgh, Pa.

A New Approach to the Design of Hot-Water-Supply Systems, by H. W. Angelery, Aerco Corporation, Englewood, N. J.

• **THURSDAY AND FRIDAY PAPERS.**—On Thursday and Friday, reports will be given by the Steam Station Engineering Committee, Walter M. Gillespie, Chairman, The Dayton Power and Light Company, Dayton, Ohio; Air Conditioning Committee, Robert D. Martin, Chairman, Consolidated Edison Company of New York, Inc., New York, N. Y.; Campus Heating Committee, George K. Saurwein, Chairman, Negea Service Corporation, Cambridge, Mass.; Sales Development Committee, James W. Heaton, Chairman, Philadelphia Electric Co., Philadelphia, Pa.; Metering Committee, William G. Gillin, Chairman, Consolidated Edison Company of New York, Inc., and the following papers:

Survey of Air Conditioning Load in the District Steam Laundry.

Steam Performance Data on All-Year Air Conditioning Systems Using Steam Service in New York City, by Robert E. Burke, Consolidated Edison Company of New York, Inc., New York, N. Y.

News and Views of Carrier Absorption Installations, by Victor Cole, Carrier Corporation, Syracuse, N. Y.

Steam Consumption in University Buildings, by Robert Y. Sigworth, The Pennsylvania State University, State College, Pa.

New Business, 1953, by Sterling S. Sanford, The Detroit Edison Company, Detroit, Mich.

A Control System As a Sales Tool, by Henry T. Kucera, Automatic Devices Company, Inc., Western Springs, Ill.

The Transition From a Seller's to a Buyer's Market, by J. Frank Gaskill, Philadelphia Electric Company, Philadelphia, Pa.

The Installation of New Stokers at the Beacon Heating Plant, by David O. Foltz, The Detroit Edison Company, Detroit, Mich.

New Steam Generating Equipment at Station 9, by George M. Johnson, Rochester Gas and Electric Corporation, Rochester, N. Y.

Shop Testing and Repairing of Condensate Meters, by John R. Heath, The Cleveland Electric Illuminating Company, Cleveland, Ohio.

Possible Improvements in Condensate Meters, by Robert L. Fitzgerald, Duluth Steam Corporation, Duluth, Minn.

While We Are Waiting, by Richard H. Brown, Rochester Gas and Electric Corporation, Rochester, N. Y.

Dual Ranging Shuntflo Meters by Means of Squires Pressure-Reducing Valves, by Jay P. AuWerter, The C. E. Squires Company, Cleveland, Ohio and Robert C. Willson, Ohio Edison Company, Akron, Ohio.

AIR CONDITIONING SURVEY

by AGA covers 325 housewives, finds benefits to health and pocketbook, a few complaints.

A survey by the Home Service Committee of American Gas Association brought returns from 325 homemakers and represents a gas industry scoop as the first survey of housewives conducted solely by other women on this subject.

Particularly significant is the disclosure that the natural resistance women often express to air conditioning disappears once they actually experience its many convenience and health features in their own homes. Final tabulations show that the most prevalent reasons for selecting gas all-year air conditioning were (1) it was considered the best, and (2) its low operating cost.

• **SAVINGS.**—Two-thirds of the homemakers interviewed reported that the general health of their families had improved since living in their air conditioned homes. More than one-fifth of this group noted savings in doctor bills and medical expenses. More than four-fifths of the interviews reported that less cleaning work was required since their homes were air conditioned.

Many women stated that with air conditioning their families stay home for more meals, more evenings and more of their vacations. Sizable savings in recreation and vacation expenses were noted.

Two-thirds of the homeowners interviewed considered air conditioning *essential* while most of the remaining one-third considered it *desirable.*

• **ANSWERS.**—Results are based on returns from 325 homemakers constituting a representative sample of residential air conditioning installations throughout the United States, with the exception of the southeastern area. A summary follows:

(1) How many people living at home?
Adults 782 Children 390

(2) How long has air conditioning been in this home?
Years 2.9 average

(3) What size is the air conditioner?
3 ton 106 5 ton 206 8 ton 2 10 ton 10 15 ton 1

(4) Did the family buy a house which already had air conditioning? Yes 51 Decided to have air conditioning in their home? 274
Reason for decision: Considered best (102), low operating cost (81), liked combination unit (16),

(*Continued on page* 146)

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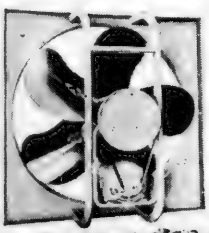

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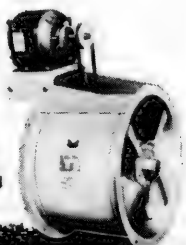

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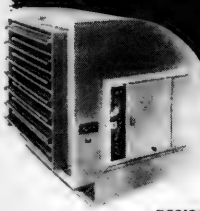

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AIR CONDITIONING SURVEY

(*Continued from page* 144)

Gas Co. reputation and recommendation (15), only available (7), recommended by friends (6), Gas Co. service (5), silent operation (4), national advertising (3), others (11), none given (24).

(5) Have any changes been noticed in the general health of the family since living in their air conditioned home? Yes 213 No 112

Benefits mentioned:

A. Family rests better at night 224
B. Fewer colds 50
C. Better appetites and eating habits 95
D. Relief from asthma 23
E. Relief from hay fever or pollen allergies 68
F. Health and comfort of baby improved 33

Other benefits: Sinus relief (8), Nerves relaxed (5), Arthritis relief (2), Disappearance of heat sickness (2).

By chance, any bad effects: More colds (5), Arthritis irritation (3), Sinus bothered at night (2), Hay fever irritated (1), rheumatism bothered (1)

(6) Have there been any savings in doctor bills and medicine expenses that can be attributed to their home being air conditioned?

Yes 47 No 180 No Opinion 98

If Yes, how much saved in a Year:

$200 (1), $150 (1), $50 (1), $25-30 (1).

If an estimate in dollars is not available, how important are the savings:

A. Large savings: 8 B. Moderate savings: 20 C. Small savings 14

(Note: these figures do not include the dollar amounts shown above)

(7) Is there any difference in the household cleaning work required in their air conditioned home?

Yes 270 No 55

Benefits mentioned:

A. Less time needed for dusting furniture 244
B. Less cleaning of walls and woodwork 193
C. Less use of domestic help 38
D. Less frequent cleaning of drapes or curtains, slip covers, rugs, and upholstery 190
E. Less redecorating required 85

Other benefits: Easier to keep help (5), no mildew (4), no sweating walls (4), less silver tarnish (2), no cobwebs (1), fewer moths (1).

By chance, any increases in housework: Drapes near vents get dirty (10), more dust (6), silver tarnishes faster (1), more lint (3).

(8) Have there been any savings in cleaning expenses that could be attributed to air conditioning in their home? Yes 145 No 80 No Opinion 100

If Yes, how much saved in a Year:

$10 per week (1), $300 (1), $250 (1), $100 (1), $60 (1), $50 (3), $40 (2), $30 (1).

If an estimate in dollars is not available, how important are the savings?

A. Large savings 34 B. Moderate savings 75 C. Small savings 23

(Note: these figures do not include the dollar amounts shown above)

(9) Has there been any change in the eating habits of the family, such as the frequency of going to an air conditioned restaurant to avoid the heat?

A. No change 129 B. More meals at home 160 C. No opinion 36

(10) Have there been any savings in eating expenses in the summer time which could be attributed to air conditioned comfort at home?

Yes 92 No 140 No Opinion 93

If Yes, how much saved in a Summer:

$60 per month (1), $200 (1), $150 (1), $50 (1).

If an estimate in dollars is not available, how important are the savings:

A. Large savings 11 B. Moderate savings 41 C. Small savings 30

(Note: these figures do not include the dollar amounts shown above)

(11) Is there any difference in family recreation activities since living in an air conditioned home?

Yes 232 No 93

Benefits mentioned:

A. Fewer air conditioned movies 95
B. Fewer week-ends in the country 98
C. More evenings spent at home instead of going out 200
D. Fewer trips to parks and swimming pools 66

Other changes: More entertaining at home (45), don't desire to leave home (18).

(12) Has having an air conditioned home increased or decreased family expenditures for outside recreation?

Decrease in Expense 126 Increase in Expense 7 No Opinion 192

If a Decrease, how much a summer:

$5 per week (1), $200 (1).

If an estimate in dollars is not available, how important are the savings: A. Large savings 16 B. Moderate savings 54 C. Small savings 44

(Note: dollar amounts shown above not included)

(13) Has there been any change in the way vacations are taken now that their home has been air conditioned?

Yes 102 No 174 No Opinion 49

Changes mentioned:

A. Vacations no longer taken just to avoid the heat 67
B. Vacations taken in winter rather than summer 44
C. Less of the vacation period spent away from home because of the air conditioned comfort at home 74

Other changes: No vacations desired (7), No hay fever trip needed (2).

(14) Have there been any savings in vacation expenses because their home is air conditioned?

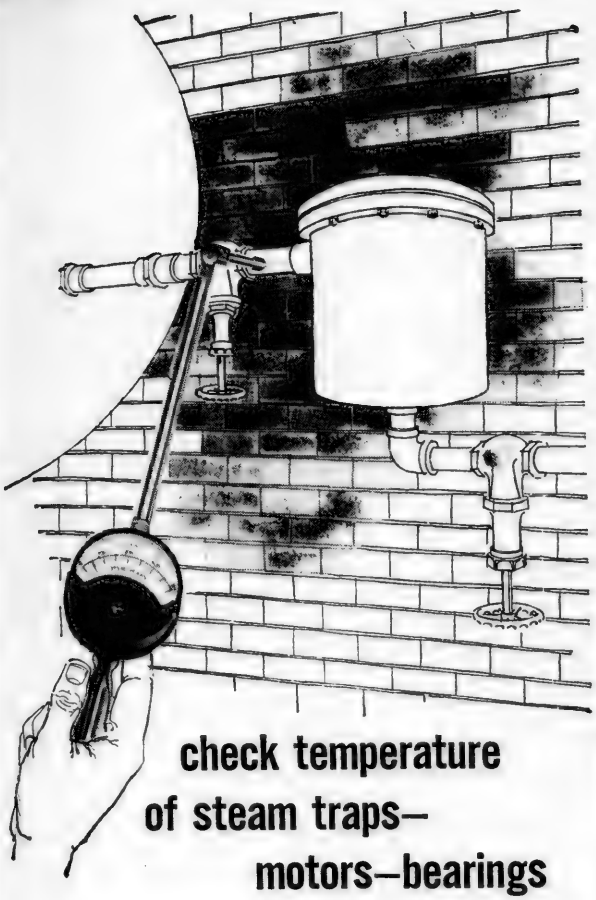
Yes 59 No 158 No Opinion 108

(15) Have there been any troubles with the conditioner?

Yes 171 No 154

If Yes, what were they:

(*Continued on page* 148)



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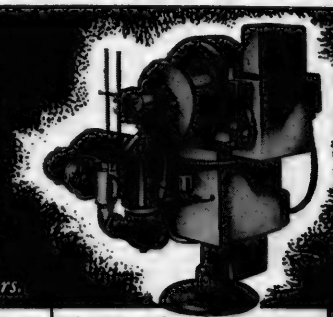

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LOW SILHOUETTE—for a neat installation that will not extend above the normal roof parapet.

AVAILABLE—Shipment of all sizes and types of ventilators can be made without delay.

COMPETITIVELY LOW-PRICED—You'll be amazed at the price of Carnes Roof Ventilators. Prices are in line with **ordinary** ventilators.

NON-SPARKING ALUMINUM FAN WHEELS—This important safety feature is standard equipment. Available in both backwardly inclined centrifugal fan wheels and axial flow fans.

ALL-ALUMINUM CONSTRUCTION—For years and years of dependable non-rusting service and highest quality appearance.

CARNES

The Most Talked About Name in Air Distribution

W. R. CARNES CO. **VERONA, WISCONSIN**

AIR CONDITIONING SURVEY

(*Continued from page* 146)

Minor troubles (62), air distribution (21), water troubles (17), tower troubles (11), noisy air distribution system (12), new fan motor (7), not cooling enough (6), control trouble (11), pilot outage (3), non-condensibles in unit (3), unit replaced (4), musty smell (2), other miscellaneous reasons (4), no reason given (14).

(16) Temperature setting of thermostats in the summer time:

65 (1), 68 to 70 (1), 72 to 73 (1), 72 (36), 73 to 75 (1), 75 to 77 (1), 68 (6), 70 to 71 (1), 72 to 74 (9), 73 (7), 74 to 75 (3), 75 to 78 (3), 70 (19), 70 to 75 (1), 72 to 75 (4), 74 (47), 74 to 76 (2), 75 to 80 (3), 71 (1), 70 to 72 (4), 72 to 76 (1), 75 (52), 75 to 76 (3), 76 to 77 (1), 76 to 78 (5), 76 (27), 78 to 80 (3), 78 (46), 82 (1), 87 (1), 80 to 85 (2), 76 to 80 (2), 77 (5), 80 to 82 (1), 80 (8), 85 (1), 88 (1), None (14)

LONDON LETTER

(*Concluded from page* 117)

in Germany or the U.S.A. (for different reasons), and $1\frac{1}{4} \times 10^9$ in France. We have been brought up to a decimal "point", which is ideally half-way up the type face, thus 0·1. But in practice, since few typewriters are equipped to put it there, it has become identical with a full stop. Metrical Europe uses a comma for the decimal point, and where we use commas for dividing large figures into groups of three France is satisfied with a space but Austria prescribes full stops.

Originally (and still to be found in English, French and German dictionaries) there was a word *milliard(e)* for a thousand million, and billion, trillion, etc., meant (and still do in Britain and Germany) the square, cube etc., of a million. The French started debasing the billion and Americans have followed, and the infection is now spreading to this country with the result that the word is meaningless unless qualified by the adjective "English" or "American."

Is it altogether too late to make a plea for a return to a notation in which octillion would mean a million to the 8th power instead of a thousand to the 9th? If one wants to go up in thousands, what about a new series such as *bizand, trizand, quadrizand?* Or could we not talk of milliards of dollars and millards of Btu for national budgets or the outputs of heating appliances?

Of course, one must not go too far. If you start talking of billiards, you're snookered.

Useful References

Mass-systeme. H. Lininger, *Gas, Wasser, Warme,* **5,** *3,* 59

A propos des unités employées en Chauffage. G. Prud'hon, *Chauffage, Ventilation, Conditionnement,* **28,** *4,* 10

A propos de la calorie. M. Videlaine. *ibid, 6,* 26

Old and new units of measure in heating, ventilating and air conditioning. Dr. Ing. F. Squassi. La Termotecnica (Milan) **8,** *2,* 117

You can have DRY AIR with exact moisture control..

Assembling Electronic Parts

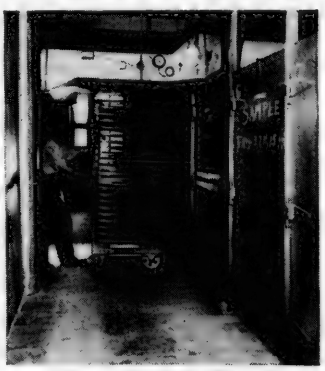
FOR YOUR COMFORT

FOR YOUR PROCESS

FOR TESTING MACHINES OR MATERIALS AT ANY TIME OF THE YEAR

Packaging Food Products

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.



Drying Industrial Material

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

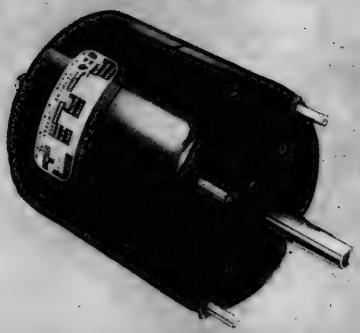
Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

Dept. HV, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

50 MILLION MOTORS



CAN'T BE WRONG!

THAT'S THE NUMBER OF REDMOND MICROMOTORS IN USE OVER THE PAST *25 YEARS*

A CUSTOMER ACCEPTANCE RECORD BASED ON LONG, DEPENDABLE PERFORMANCE!

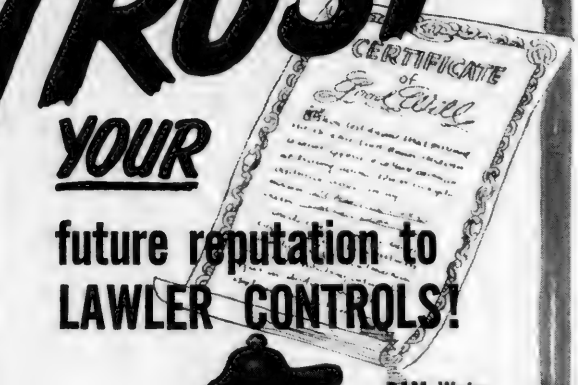
Compactness and simplicity of design have made these MicroMotors the most popular low-priced power packages in the field of shaded pole motors. Features include selectively fitted self-aligning porous bronze bearings, plus impregnated windings highly resistant to oil and moisture. An excellent choice where open ventilation is suitable and light weight desirable. Call on Redmond's "Customer Engineering Service" when you select the motor for your particular application. Just drop us a line.

REDMOND

Redmond COMPANY, INC.

OWOSSO, MICHIGAN

TRUST YOUR future reputation to LAWLER CONTROLS!



BAM Water Controller

For group showers . . . hospitals . . . industrial purposes . . . single outlets . . . multi-outlets.

Lawler's "Performance-Tested" design combines pioneering experience with engineering leadership. The use of specially chosen metals assures YOUR customers years of positive, accurate temperature control with lowest maintenance cost . . . the best insurance YOUR REPUTATION can have!

Compare!

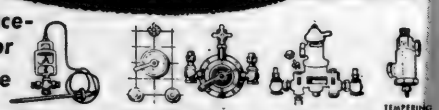
List the facts . . . Check them off . . . Lawler comes out first every time! YOUR REPUTATION is protected!

COMPARATIVE CHECK LIST

LAWLER BAM WATER CONTROLLER	Product "A"	Product "B"
Most Complete Line ✓	✓	
Hydraulic Thermostat ✓		✓
Polished Chrome ✓	✓	
Non-Ferrous Construction ✓		✓
Loose Key Angle Stops ✓		

The Lawler Line Thermostatic Controls

"Performance-Tested" for Longer Life



STEAM TEMPERATURE REGULATORS · SHOWER MIXING VALVES · WATER CONTROLLERS · TEMPERING VALVES

LAWLER AUTOMATIC CONTROLS, INC.

453 North MacQuesten Parkway Mount Vernon, New York

EXPERIENCE IS MY CLASSROOM

(*Concluded from page* 115)

The 8-inch main is 3.8 times as heavy as the 3-inch main and therefore requires that much more heat, having a steam capacity 13.35 times as great, it can warm itself up (13.35/3.8) 3.5 times faster. The 8-inch main warms up in 1.15 minutes, therefore the 3-inch main takes (1.15 × 3.5) four minutes to warm up.

The 8-inch, further compared to the 3-inch, has a steam content or volume to draw upon which is 6.8 times as great, to wet an interior metal perimeter that is 2.6 times greater, and with a velocity 2.9 greater. In other words, there is a lot more of steam to serve a greater heat transfer surface at a higher velocity to wipe away non-conducting films. The 8-inch also refills with steam about twice as often. As against these things, its normal radiation and convection loss is 2.1 times as great and there is 6.8 times as much initial air to be driven out.

These comments are based upon the following conditions:

Two steam mains, 3-inch and 8-inch dia, 200 ft long, are served by separate low pressure (1 psi) automatically fired boiler and pump to maintain 10 inches vacuum. With fittings included, each main has an equivalent length of run that is twice the actual run (as customarily assumed), or 400 ft. The 8-inch main in practice might have a greater run, but it could be, in many cases, no longer than the 3-inch main. It was made the same for comparative results on pipe sizes. Mains are insulated with one inch of 85% magnesia.

Properties of steam for average steam pressure during warming up are temperature, 214.5F; heat of the liquid (sensible heat), 183.1 Btu per lb; latent heat, 968.7 Btu per lb; specific volume, 25.6 cu ft per lb; and for 10 inches of vacuum, 160.3 Btu per lb heat of liquid and 982.7 Btu per lb, latent heat. Assumed pressure drop is 2 oz per 100 ft. Specific heat of steel is 0.117 and temperature rise in warming up the space is from 70F to 145F.

The 3-inch main weighs 1,524 lb, has an air and steam volume of 10.3 cu ft and a steam capacity (for the given and commonly accepted conditions) of 411 lb per hour. To this figure must be added 20% for pick-up. Therefore steam capacity at time of pick-up is 493 lbs. This increases the velocity from 3,402 fpm to 4,082 fpm, and in accordance with the rule, as the square of the velocity, raises the total pressure drop another 3½ oz. In the same order, for the 8-inch main, weight 5,762 lb; volume 69.5 cu ft; steam capacity 5,490 lb plus 20% equals 6,588 lb; and steam velocity 8,145 fpm plus 20% equals 9,774 fpm.

The graph previously mentioned gives 0.38 Btu per linear foot of 3-inch insulated pipe per hour (deg F temperature difference) for radiation and convection losses for 72.5F (average during warming up). For 8-inch pipe, the figure is 0.8 Btu. This last is for basic information. However, heat losses from the mains were not included, since in resulting calculations, they were found an insignificant quantity, especially so for average temperature rise and the very few minutes shown necessary for duration of warming up. For similar reasons, the heat required to raise the insulation to some final temperature below that of the steam has also not been included.

HEATING AND VENTILATING'S

Ad-Digest SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

DUCT INSULATION. Page 44. Insulation for cooling and heating ducts which is installed in reduced time but with increased overall efficiency, requires no special cutting tools, and is available with various type of vapor barriers for temperatures up to 450 degrees. Advertisement shows how to install the insulation; folder is also available. ----------Item 201

BOILER WATER LEVER CONTROL. Page 156. A boiler water level control which uses magnetic force to provide the control. Has infinite operating life, least possible servicing, easy and simple maintenance, and is easiest to adjust in the field. Catalog available.----------Item 202

FUEL BURNERS. Page 37. Fuel burners available for gas, oil or dual-fuel and with factory-packaged approved electronic combustion safeguard system. Available in sizes from 30 to 1,000 hp. Information available. ----------Item 203

DIRECT FIRED HEATERS. Page 151. Direct fired heaters in six models with capacities from 200,000 to 2,000,000 Btu per hour. All heaters are completely wired and assembled at the factory. Information and specifications available.-------Item 204

REFRIGERATION SPECIALTIES. Inside back cover. Refrigeration valves, driers and strainers made by a company whose production history extends over the past 40 years. Products include valves, driers, strainers, control devices and accessories for refrigeration and air conditioning and industrial applications.----------Item 205

CONVECTORS. Page 38. 740 ultra-modern living units in the 1350 Lakeshore Drive Apartments, Chicago, are heated by this company's convectors, which fit perfectly into functional interiors. Available for wall, recessed or free-standing installation. ----------Item 206

PERIMETER HEATING REGISTER. Page 159. A diffusing type floor register engineered for perimeter heating with warm air. Available in 7 sizes; has many applications other than perimeter heating such as in stair risers, under kitchen cabinets, and so on. Catalog available.-------Item 207

PYROMETER. Page 147. A portable contact pyrometer for taking surface temperatures, and which can be most useful in connection with maintenance and installation; for example, in taking the temperature of a pipeline at a steam trap. Eight standard scale ranges available up to 1200 F. Bulletin available.-----Item 208

VARIABLE DRIVE MOTORS. Page 143. Any rpm. can be obtained by dial control with this line of varidrive motors which require no extra space. Available in ¼- to 50-hp., 2 to 10,000 r.p.m. Booklet available. ----------Item 209

FRESH AIR SUPPLY HEATERS. Page 52. When air is exhausted from industrial plants the incoming air must be heated and this is done by these fresh air supply heaters for wall or window mounting. Also available in a roof type. They cannot freeze and give uniform discharge temperature. Motorized chimney draft also available.----------Item 210

PRESSURE RELIEF VALVE. Back cover. In this series of relief valves there is a valve for practically every job. For hot water heating boilers there are valves with capacities ranging from 303,000 to over 2,000,000 Btu per hour and for hot water tanks there are valves with capacities ranging from 502,000 to 925,000 Btu per hour each. Information available. ----------Item 211

TEMPERATURE CONTROL. Pages 16-17. How all sorts of temperature are controlled in the new Chicago State Tuberculosis Sanitarium. Modern operating rooms are air conditioned and pneumatically controlled by this company's thermostats and hygrostats. X-ray room and research lab and other spaces are similarly controlled as are many different types of showers and baths. Although this installation has a diversity of controls, only a few of the company's complete line are used in this building. Information available. ----------Item 212

HEAT EXCHANGERS. Page 71. Industrial fluid heaters of a variety of types including instantaneous water heaters, converters, tank heating units, storage tanks, fuel oil heaters and indirect heaters in a wide range of sizes for numerous uses in heating and ventilating work. Catalog available.----------Item 213

PORTABLE UTILITY FANS. Page 159. These fans for product and personnel cooling, drying, exhausting and ventilating have four 180 degree high velocity air discharge. Available in sizes from 16 to 36 inches. Folder available.----------Item 214

MOTION PICTURES. Page 50. Two motion pictures are available from this company in full color and sound. One, "The Story of Radiant Heating," the other, "Down the Drain." Latter shows how copper, soil, waste and vent lines are installed with less effort, quicker and neater and at no extra cost. Movies are available to contractors, wholesalers and others on request.----------Item 215

AIR TURNING VANES. Pages 154-155. The original job-tested rail, a fast, accurate and inexpensive way of making air turning vanes with installed cost cut 50% to 70%. Eliminates layout and is supplied in 8-foot lengths. Manual available. Item 216

AIR DISTRIBUTION. Page 66. How removable cores simplify installation of air diffusers in the home office building of Dun & Bradstreet which employs 769 of these diffusers. The square ceiling diffusers are adjustable and the removable cores facilitate cleaning of ducts and grilles. Bulletins available.--------Item 217

FLEXIBLE HOSE. Page 165. A line of flexible spiral-wire reinforced hose in sizes from 1¼ to 36 inches for handling air, dust, gases, materials and available with accessories in a variety of coatings. Catalog. ----------Item 218

PANEL HEATING. Page 28. Emphasizing the fact that panel heating is invisible and flexible, this advertisement points out the detailed advantages of radiant heating. A 48-page color booklet, "Radiant Panel Heating with Steel Pipe," is offered. ----------Item 219

SMALL MOTORS. Page 149. A line of micromotors of the shaded pole type and of which 50,000,000 have been placed in use over the last 25 years. Information available.----------Item 220

MOTORS. Page 31. A company which has made motors for 63 years and offers them in a wide variety of applications in ratings from 1/20 to 5 hp. and hermetic motors from ⅛ to 20 hp. A series of motor data bulletins is available.---------Item 221

CONTROL SYSTEMS. Page 45. How the modern Lytton's store in Evanston, Ill., depends on this company's control for all-weather comfort. These controls are in command of the heating and air conditioning systems to insure the ultimate in shopping comfort. In addition, these control the snow melting equipment which keeps walks free of snow and ice through winter months. Information available. ----------Item 222

Enter numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Enter below item numbers on which you wish further information.

Item No.....	Item No.....	Item No.....	Item No.....	Item No.....
Item No.....	Item No.....	Item No.....	Item No.....	

PLEASE PRINT May AD-54

Name .....Title .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....Zone..... State.....

This card is void after Aug. 1, 1954

Ad-Digest SERVICE

COPPER WATER TUBE. Page 127. An endorsement of panel heating with copper water tube is given by a heating contractor who has been in the business for 30 years and in the radiant heating field for 9 years. He prefers this company's tube because it is easy to bend and handle, comes in long lengths which require fewer fittings, and it cannot rust so that the contractor is kept out of trouble. Information available.....Item 223

BALANCING VALVES. Page 62. These valves give accurate control of water flow and positive shut-off for air elimination in connection with radiant hot water heat. Made with flared fittings for ⅜- and ½-inch tubing. A line of manifolds with or without the balancing valve is available. .....Item 224

VACUUM BREAKER. Page 9. A vacuum breaker for this company's flush valve use is completely individual, easily repaired and adaptable to any flush valve. The vacuum breaker telltales the slightest defect by water spillage. Detailed flush valve and vacumm breaker data in the company's handbook and catalog 53. .....Item 225

UNIT HEATERS. Page 164. Unit heaters in four types, projection unit heater, a 4-way directed flow unit heater, horizontal air discharge type, and gas fired unit. Units are simple, efficient, powerful and easy to control in volume as well as direction. Information available. Item 226

COOLING TOWERS. Page 2. How pressure creosoting adds years of life to this company's cooling towers. Constantly wetted wood decking in a cooling tower is subject to attack by fungus and marine parasites. Wood used in this company's towers is protected against these enemies. .....Item 227

HEATING AND AIR CONDITIONING. Page 157. A comprehensive line of heating and air conditioning units, including coils, coolers, and air conditioning unts. Catalog available.....Item 228

PIPING LAYOUTS. Page 59. A piping layout for a non-freeze cooling tower is shown in this advertisement, available separately with description and in an enlarged form and clearly shows the manufacturer's valve recommendations. .....Item 229

AIR FILTER. Pages 26-27. Introducing the company's new dry type air filter that maintains its efficiency automatically up to a year with one roll of low-cost glass fiber media. The mat is made in continuous lengths up to 70 feet and is installed in the filter like the film in a camera. One roll is sufficient for a year's operation per 10,000 cfm of capacity. Catalog available. .....Item 230

AIR CONDITIONERS. Pages 24-25. This company's 24-page catalog will give you a big assist in planning the installation of central station air conditioners that will meet the requirements of the job in every particular. Company makes air conditioning units in both horizontal and vertical types, together with a wide range of other heat transfer equipment. Catalog available. .....Item 231

HEATING PUMPS. Page 41. This company, which makes a line of heating pumps, recently had occasion to rush a shipment of ten of its boiler feed pumps to an east coast air base, the pumps being picked up by the U. S. Air Force. Proven performance is the answer.....Item 232

UTILITY VENTILATING SETS. Page 153. These fans are available in a belt drive and a direct drive and are furnished ready to install to duct work and electrical connections. Accessories available include hood covers, automatic shutters mounted in fan discharge and outlet control damper. Catalog available.....Item 233

PIPING FOR PERMANENCE. Page 7. A bulletin of this title has been issued by this manufacturer of wrought iron pipe and gives information on requisites of a piping system, building piping systems, water and water problems and how the manufacturer can help you. Bulletin on request. .....Item 234

COOLING TOWERS. Page 79. A new booklet by this cooling tower manufacturer can be used as a training manual for dealers and servicemen, explains the function of cooling towers, describes the workings of various types, aids in selecting the proper tower, gives advice on location, piping and wiring, installation and maintenance instructions. Copies available for a limited time.....Item 235

STEEL PIPE. Page 68. For fast, sure welding use this company's steel pipe which takes welding easily because it is made of topgrade steel. Advertisement lists 7 points of uniform goodness in the company's steel pipe. .....Item 236

UNDERGROUND PIPE INSULATION. Pages 10-11. Numerous illustrations in this advertisement show how simple system, a complex system, and large pipes as well as small can be insulated with this material which forms a permanent monolithic protection around one pipe or a dozen without joints or voids. You will find it usually the most economical of all systems to install. Advantages are listed. Booklet available.....Item 237

ROOM AIR CONDITIONERS. Pages 12-13. A new room unit for cooling and heating hotels, apartments, motels, offices, hospitals, schools and homes. Cabinet contains the fans, motor, heat transfer surface and filter to which is fed hot water in the winter time and cold water in the summer. This is a new piece of equipment and is available in the console type as well as the concealed type for built-in installation behind a finished wall, and an overhead type with casing for exposed ceiling installation and an overhead type without casing for use with ducts above a false ceiling or in a closet. Bulletin available. .....Item 238

COPPER TUBE. Page 39. Copper tubing is being used in refrigeration and air conditioning installations because of its easy installation and lower labor costs, non-rusting and other features. This company makes tubing, restrictor tube, thermal expansion bulbs, hard copper tube cut to length, fittings, vibration eliminators and other products for the refrigeration industry. Information available.....Item 239

CIRCULATOR. Page 63. A European hot water circulator distinguished for excellent design and available for manufacture under license in the United States. .....Item 240

BOILERS. Page 61. How this company's type FM integral furnace boiler is being used in a new hospital in Jamaica and helps keep the cost of steam low. These boilers save erection time and cost, meet a wide range of service, handle quick load changes, and burn oil and/or gas. Available in standard sizes for loads ranging from 2,900 to 28,000 pounds of steam per hour. Bulletin available.....Item 241

PIPE HANGERS. Inside front cover. This company makes a stock pipehanger for every piping requirement. This advertisement is devoted to an adjustable swivel pipe ring of the split ring type, and in which the hinging of the ring is off center which provides sufficient seating to hold pipe before closing ring. This type is available in 12 sizes with capacities from 80 to 1510 pounds.....Item 242

AUTOMATIC SHUTTER. Page 165. An automatic shutter which opens when the air current starts and closes tight when the air current stops. Available in 12 to 72 inches square, also rectangular. Catalog available. .....Item 243

ROOF VENTILATORS. Page 1. You get all the air you pay for with this line of roof ventilators whose capacity ratings are the output of the completely assembled roof ventilator including the head. You don't have to wait for ratings on this roof ventilator which has been rated according to the Power Fan Manufacturers Association Code for years Catalog available. Item 244

EXPANSION JOINTS. Page 57. Some new facts on expansion joint maintenance based on experiences at three installations and showing the comparison of maintenance with this company's gun-packed joint and the conventional gland packed joint. Full facts on expansion joint maintenance are given in the company's bulletin. .....Item 245

AIR DIFFUSERS. Page 51. This company makes the largest selection of sizes and types for conventional or high velocity systems, and has a consistent record of prompt delivery and customer satisfaction. .....Item 246

HEATING CONTROLS. Page 162. A line of electronic controls which relates heat supply to outdoor weather, radiator air valves which can be regulated for the temperature desired in a room, and a line of motorized valves. Information available. .....Item 247

COOLING COILS. Page 159. A complete line of air cooling coils, 2 to 15 ton capacity, complete with multi-outlet expansion valves made on and ready to install. Bulletin available.....Item 248

TEMPERATURE REGULATOR. Page 36. A temperature regulator of packless construction with large balanced metal diaphragm and sensitive pilot. Functions year after year, dependably and accurately without requiring any extensive repairs or special attention. Bulletin available. .....Item 249

INDUSTRIAL BURNER. Page 77. A forced draft industrial burner for oil, gas and oil-gas combination. Advertisement shows installation in Pennsylvania school where

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

D-DIGEST SERVICE

the school authority said the burner was quiet, labor saving, efficient and very clean. It is packaged, meaning ready to install as a unit. Intended for Scotch marine or other type boilers. Information available. ----------Item 250

STRAINERS. Page 157. These strainers screen out foreign matter from oil, water, and other liquid lines. Cover is held in place by toggle bolts which simplifies removal of cover while cleaning. Available in sizes from 4 to 12 inches.----------Item 251

VENTILATION PANEL FILTER. Page 48. A dry panel filter available with a wide range of media and operates at maximum efficiency with any medium that comes in sheet form and can be crimped. Can be used for hundreds of applications. Bulletin available.----------Item 252

DOUBLE-WALLED TUBING. Page 58. Double-walled tubing made from a single strip and which is recommended for ceiling radiant heating systems because it not only gives top performance but appreciable savings in material costs and fabrication time as well. Information available. ----------Item 253

MOTORS. Page 64. You can depend on these motors to furnish plenty of power for compressors, pumps or blowers. The motors are diversified in design, can be readily adapted to a wide range of applications. A bulletin on complete line is available. ----------Item 254

AIR CONDITIONING UNITS. Page 40. A line of air conditioning units for remote applications for multi-room installation and for larger buildings where hot water is piped to the units in the winter and chilled water in the summer. Units are available in 200, 400 and 600 cfm capacities. Bulletin available. ----------Item 255

VENTILATING SYSTEMS. Page 145. Each ventilating job presents problems that can be solved by a company having a comprehensive line, such as this one which makes axial flow fans, roof penthouse units, attic fans, duct boosters and other equipment. Data sheets available.----------Item 256

WATER SYSTEM CONTROLS. Page 150. A line of thermostatically operated controls for group showers in hospitals or industrial plants, arranged for either single or multi-outlet systems. Use of special metals assures positive temperature control with lowest maintenance cost. Line includes steam temperature regulators, shower mixing valves, water controllers and tempering valves.----------Item 257

AIR CONDITIONING PUMPS. Page 157. A line of pumps from ¼ hp to 5 hp producing heads to 190 feet and capacities up to 110 gpm. Features an exclusive impeller volute design. Can be installed horizontally or vertically. Details available. Item 258

BURNERS FOR HEAVY OIL. Page 158. A line of burners for heavy No. 5 oil for commercial, industrial, and institutional installations in sizes from 1 to 60 gph capacity. Burner is designed to burn No. 5 oil without pre-heating. Customers report savings. Information available.---Item 259

AIR RECOVERY. Page 139. Systems for cleaning and recirculating exhaust air can be made effective with activated carbon with resulting economy. A system in a New York skyscraper is described. Information available. ----------Item 260

Enter numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLUMBING SYSTEMS. Page 43. A flexible system for installing wall type plumbing fixtures assures fast installation and accurate alignment with water type connections and minimum adjustments. Systems are above the floor, behind the wall. No need to wait for other crafts. Suitable for all types of off the floor plumbing fixtures. Booklet available.----------Item 261

AIR DIFFUSERS. Page 160. A wide variety of square and rectangular diffusers offers freedom of design in a variety of louvered patterns. Built-in diffusing vanes provide blows in 1, 2, 3 or 4 directions without use of blank-offs. A slender continuous air diffuser is also featured. Catalog available. ----------Item 262

AIR FILTERS. Page 161. A line of panel-type air filters featuring high velocity, high efficiency, and low space requirements gives long service life and low installation and maintenance costs. Filters are designed for an approach velocity of 530 fpm. Cost comparison chart available. ----------Item 263

HOT WATER HEATERS. Page 135. Commercially sized copper lined hot water storage heater designed with a heavy steel shell so that water touches only non-rusting copper is featured at the Waldorf-Astoria Hotel in New York. Long life and low maintenance costs are emphasized. Information available.----------Item 264

AIR CONDITIONING FRANCHISE. Page 65. Benefits of continuous and extensive advertising of a line of packaged air conditioners and wide public acceptance of the manufacturer's name are offered as inducements for handling this manufacturer's franchise for units from to 15 hp. Information available.----------Item 265

QUIET FAN. Page 29. A new limit load ventilating fan for handling large volumes of air where quiet operation is essential. Features smooth air handling from inlet to outlet. Bulletin available.-------Item 266

DUST AND GREASE FILTERS. Page 153. A line of panel type air filters and grease filters, viscous type, permanent, and cleanable. Features drain slots for quick cleaning, welded corners, galvanized steel frames, and expanded metal face plates. Bulletin available.----------Item 267

SELF-CLEANING AIR FILTER. Page 34. An automatic self-cleaning air filter in which panels in a revolving curtain are submerged in cleaning solution and agitated by a compressed air drive for complete cleaning and renewal of adhesive. Filter goes 3 to 6 months without attention. Information available.-------Item 268

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Use this Digest to locate and refer to advertisements appearing in this issue of HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

HEATING-AIR CONDITIONING FRANCHISE. Page 32. Manufacturer offers dealerships in a complete line of heating, air conditioning and water heating equipment carrying a name established over 45 years with consistent advertising, quality products, local service, and traveling sales training and service teams. Inquiries invited.----------Item 270

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COMPRESSORS. Page 35. Hermetically sealed, welded motor compressors in an engineered package combine a twin-cylinder quiet operating compressor with heavy-duty motor for F-12 refrigeration systems. Manufacturers invited to try unit in equipment.----------Item 276

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PUMPS. Page 74. A series of close-coupled pumps equipped with a leak-proof mechanical seal and featuring quiet operation without overload throughout the operating range. Sizes are ½ hp. to 1½ hp. at 3,500 rpm. Pumps are recommended for air conditioning and hot water circulating applications.....Item 277

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DUAL FUEL BURNER. Page 147. A combination gas and oil burner factory assembled and tested for forced draft applications, features automatic ignition for both fuels using standard controls. Change-over is either automatic or manual. Capacities to 2,000,000 Btu per hour. Literature available.....Item 279

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AIR CONDITIONING PUMPS. Page 141. Pre-engineered to save time, these pumps increase profits for you. The most complete line for air conditioning applications includes packaged pumps, a close-coupled pump with either conventional packing or mechanical seal, a supporting adapter pump with flange motor and a vertical mounted pump with mechanical seal or sealless with choice of submerged or sidewall mounting. Bulletins available.....Item 296

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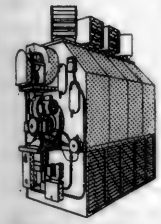

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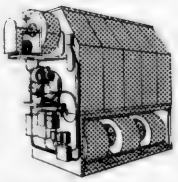

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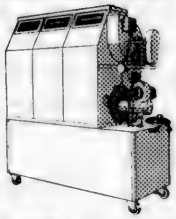

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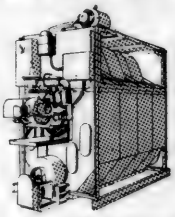

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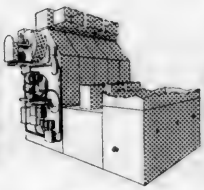

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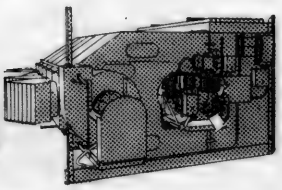

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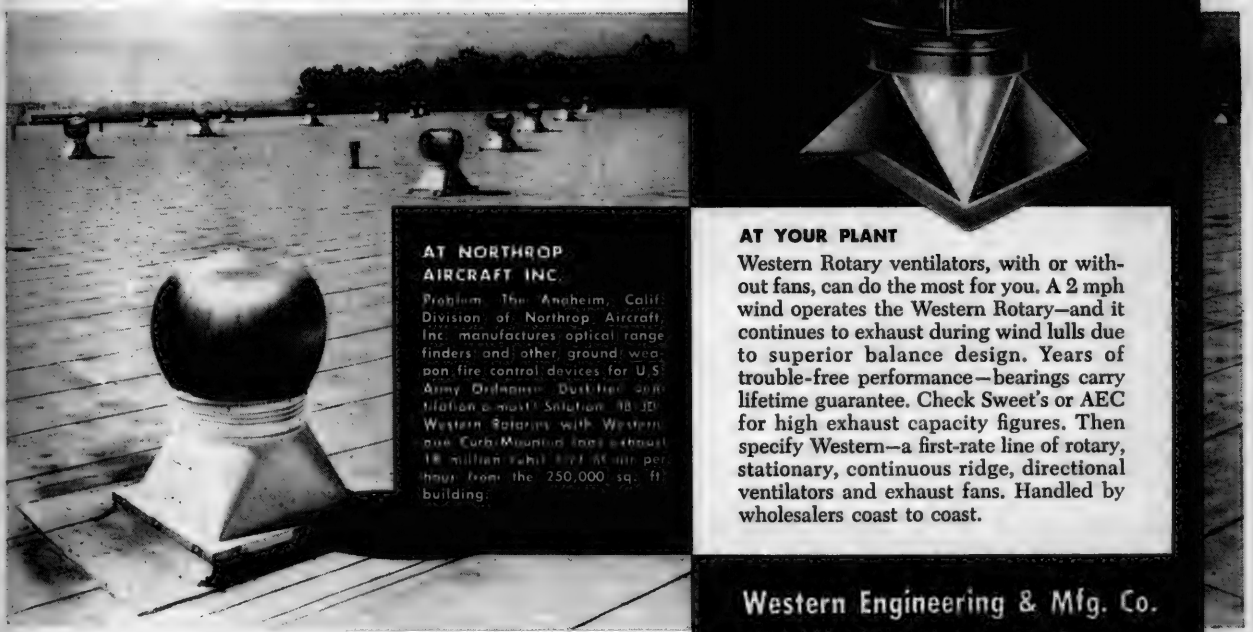

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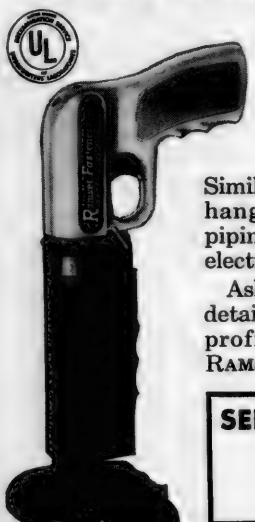
By using RAMSET Jobmaster, anchoring studs were set at the rate of better than 1 per minute, instead of an estimated 15 minutes each by old-fashioned, conventional methods. Substantial cost savings were thus gained, as well as a far faster, completely secure installation. Similar results were obtained for hanging 13 miles of sprinkler piping and anchoring 43 miles of electric conduit.



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ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

MACHINERY'S HANDBOOK

Just published is the fifteenth edition of Machinery's Handbook which first appeared in 1914. During the intervening years more than 1,000,000 copies were sold, and the book is now widely used in the machinery and engineering fields.

The new edition has a completely new section on ball, roller and needle bearings; a new section on fine-pitch worm and worm gears with step-by-step design procedure; new data in nickel and nickel alloys, titanium and titanium alloys and some of the new alloys.

Additions have been made to the material on honing covering proper rotative speeds, recommended tolerances and adjustments for eliminating undesirable conditions, characteristics and applications of power brush finishing wheels. There is a revised and rearranged spur gear section and an entirely new section on generated bevel gears.

The new edition makes available recent and basic information which the handbook user in the mechanical field needs to keep abreast of current developments. As in previous editions, great care has been taken to select new matter which will be of the most value to the designers and builders in the mechanical field.

Machinery's Handbook, Fifteenth Edition. Limp binding, 4½ x 7 inches, 1,911 pages. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $9. For Canada and overseas, add 92 cents for postage.

NDHA PROCEEDINGS

The National District Heating Association has just published the proceedings of its forty-second annual meeting held at the Hotel Statler, Detroit, Mich., June, 1951. This book presents the papers given at the various meetings, committee reports, and discussions of the papers.

Official Proceedings of NDHA. Cloth bound, 6 x 9 inches, 225 pages. Published by the National District Heating Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. Price, $10.

ELEMENTARY FLUID MECHANICS

A book on the principles of fluid mechanics was prepared for the beginner in this subject, by John K. Vennard, professor of fluid mechanics, Stanford University, back in 1940. It was planned for one who has mastered the principles of basic mathematics and mechanics but who lacked previous experience in fluid phenomena. This book met with such success that a third edition has just been published.

The previous edition has been thoroughly revised and 300 new problems have been added. In addition, there is a new introductory chapter of generalizations on the subject of one dimensional fluid flow. The text is intended

(*Continued on page* 154)

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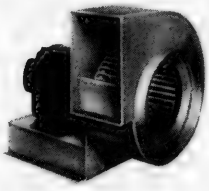
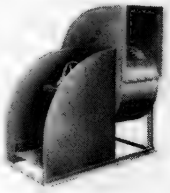
The MASSACHUSETTS Line®





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Bulletin No. 109 Catalog contains certified ratings authorized by NAFM as applied to type MSV belt drive and type S direct drive sets.
These economical package type units are furnished ready to install to duct work and electrical connections. Accessories available include hood covers, automatic shutters mounted in fan discharge and outlet control damper. The new MSV size 30 design 3 has a rugged squirrel cage type wheel and is rapidly gaining popularity.

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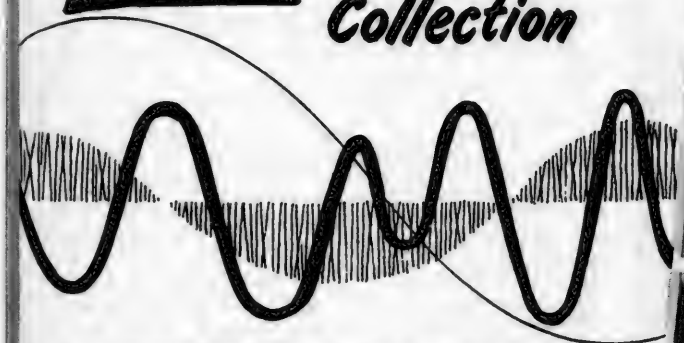

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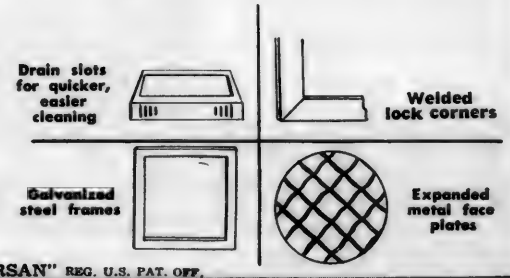

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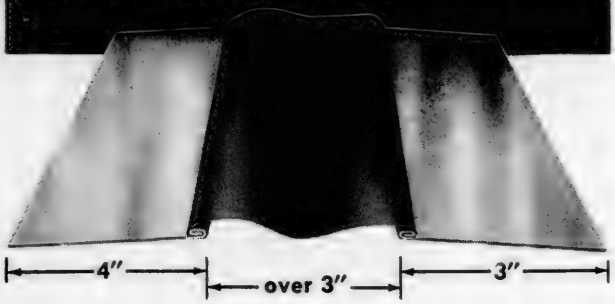

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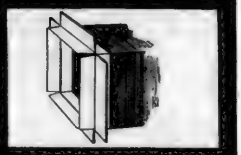
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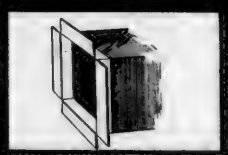
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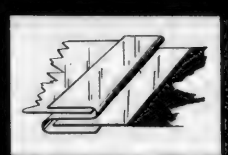
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(Continued from page 152)

for use at the third-year level of the conventional engineering curriculum and it is assumed that the student has completed courses in differential and integral calculus, in statics and dynamics, but has not had engineering thermodynamics.

Elementary Fluid Mechanics, by J. K. Vennard. Cloth bound, 5½ x 8½ inches, 401 pages. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $5.50.

THE 1954 GUIDE

The American Society of Heating and Ventilating Engineers has published its 1954 edition of The Guide.

As compared with the previous edition, there are 32 additional pages. Chapters brought up to date by major changes include Heating Load, Fuels and Combustion, Chimneys and Draft Calculations, Panel Heating, Pipe, Fittings, Weldings, District Heating, Air Cleaning, Automatic Controls, Electric Heating, and Owning and Operating Costs. There are 52 chapters in this volume, including a new chapter on residential summer air conditioning.

The 1954 Guide. Cloth bound, 6 x 9 inches, similar in binding to previous editions; technical data section, 1,128 pages, plus a catalog section of 486 pages. Published by the American Society of Heating and Ventilating Engineers, 62 Worth St., New York 13, N. Y. Price, $10.

MANUAL OF EXCELLENT MANAGEMENTS

Companies listed are found to be excellently managed during 1953 according to the audits of The American Institute of Management. Of the 4,000 companies studied during the past year, the ones listed are considered to be the best managed. In the manual are presented four basic lists as follows:

(1) A list of 348 excellently managed companies arranged alphabetically.

(2) A list of companies arranged by industry.

(3) A list of companies arranged geographically.

(4) A list by AIM rating.

Manual of Excellent Managements. Cloth bound, 8½ x 11 inches, 96 pages. Published by The American Institute of Management, 125 E. 38th St., New York 16, N. Y.

• • •

DESIGN OF HOT TAP TEE CONNECTIONS—A paper on the Design of Hot Tap Tee Connections in High Pressure Pipelines (Paper No. 53—PET-31) was presented at the ASME Petroleum Division Conference at Houston, Tex., last year. It suggests a design approach aimed at keeping the stress levels around branch connections in harmony with the stress levels common to high pressure pipelines, and methods for meeting these design requirements through the use of field fabrication with or without manufactured fittings. Reprints of this paper are available through Taylor Forge & Pipe Works, Chicago 90, Ill.

(Continued on page 156)

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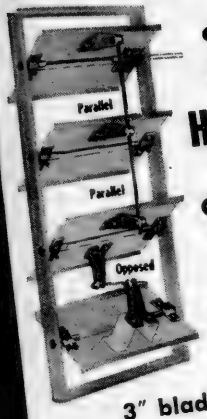

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- Ideal for light or heavy dampers, 3" blades or wider
- Corrosion-resistant throughout
- Parallel or opposed blade action
- Can be screwed, bolted, riveted, welded, spot welded

the original, job-tested

"DURO-VANE RAIL"

fast, accurate least expensive way to make engineer-approved AIR TURNING VANES

Installed Cost cut 50% to 70%

- Complete turning Vanes meet engineering specifications
- For Hollow or single Air Turning Vanes
- Eliminates layout
- Supplied in 8′ lengths—200 ft. bundles

WRITE for Free new "Visual" Manual

DURO-DYNE CORPORATION
Dept. E, 800 3rd Ave. · New Hyde Park, N. Y.

AUTOMATIC D HEATING

NOW—THE WORLD'S FIRST!

Delta's NEW

OIL-FIRED UNIT HEATER*

220,000 BTU/HR OUTPUT • GUN-TYPE OIL BURNER • 5,730 CFM AIR DELIVERY • THROWS HEAT 75 FEET • SUSPENDS OVERHEAD • EXTREMELY ECONOMICAL OPERATION • RUGGED CONSTRUCTION • FACTORY PRE-WIRED & ASSEMBLED • ADJUSTABLE LOUVRES • SUMMER AIR CIRCULATION • EASILY MADE PORTABLE • 59 COMMERCIAL APPLICATIONS • LISTED BY UNDERWRITER'S LABORATORIES

Send for full details

CUT-AWAY VIEW

*Patents Pending

SEE OUR OPERATING DISPLAY AT THE OHI EXPOSITION - BOOTHS 151-153 PHILADELPHIA MAY 16-20

DELTA HEATING CORPORATION, TRENTON 8, NEW JERSEY
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Do it with a

DOERR MOTOR!

When we say that Doerr Motors are made for tough industrial applications, we can back it up 100%. The entire range of machine tools—from power tools up to boring mills—utilize Doerr Motors for a large variety of main and auxiliary drives. Many thousands of small electric hoists, hydraulic pumps, unit heaters, exhaust fans, rotary oil burners and adjustable speed drives receive dependable power from Doerr.

If you want more information, write for Bulletin 100, which shows many of the special and standard designs available.

Electric Motors from 1/30 to 5 hp. Standard, or designed to your specification.

DOERR
Electric Corporation
EDGARDUG WISCONSIN

Buy Priceless BOILER SAFETY with "PIGGY BANK PENNIES"

MAGNETROL

The World's Safest Boiler Water Level Control

A magnetic sleeve, rising and falling within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

With boilers you're either SAFE OR YOU'RE NOT! There's no in between. Provide the assured safety of Magnetrol for only pennies more!

Magnetrol uses only infallible magnetic force to provide completely positive boiler water level control.

Inherently and by design this is the safest system known! . . . and the *only* one that insures all these benefits:

INFINITE OPERATING LIFE—there are no bellows, diaphragms, electrodes or packing boxes to fail.

LEAST SERVICING entailing call-backs or operating interruptions. The lifetime quality built into Magnetrol extends to every part.

EASIEST, SIMPLEST MAINTENANCE—normally confined to visual inspection and blow-down.

EASIEST TO ADJUST IN THE FIELD—this means simpler installation and certainty of proper functioning.

Magnetrol units are available in single or multi-stage models for all control applications. Standard boiler units for pressures of 25 to 600 lbs. WSP.

THE FULL STORY IS SO IMPORTANT IT BELONGS IN YOUR HANDS. MAIL COUPON NOW.

MAGNETROL, Inc.

MAGNETROL, Inc. 2106 S. Marshall Blvd., Chicago 23, Ill.

Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

NAME_____

COMPANY NAME_____

ADDRESS_____

(*Continued from page* 154)

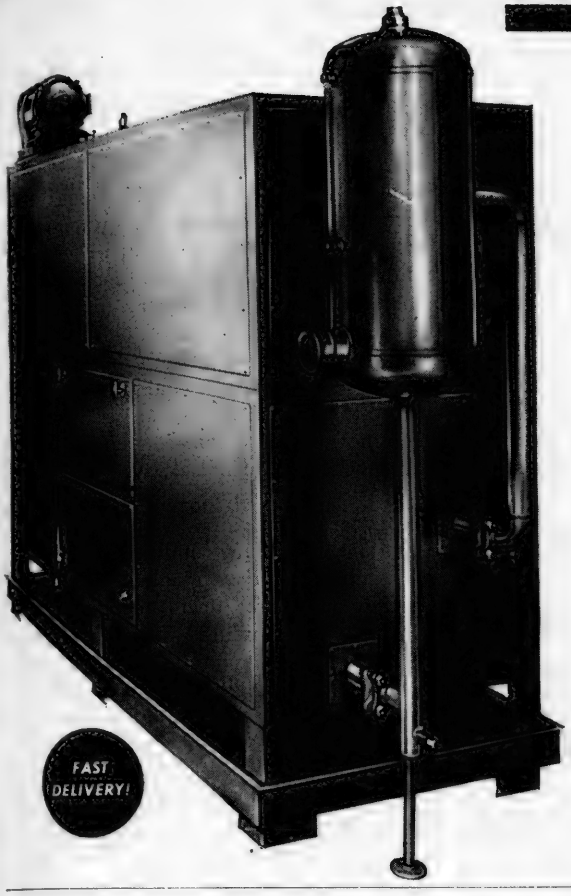
CORROSION OF COPPER TUBE SOIL STACK—Bulletin Series No. 419 on The Corrosion of Copper Tube Used in Soil Stack Installations reports results of research to observe the corrosive effect of fresh, household sewage on copper tube used as soil stacks for domestic plumbing. This investigation was sponsored by the Copper & Brass Research Association. It was found that corrosion was greatest in the continuous flow stack and least in the intermittent flow stack. University of Illinois Engineering Experiment Station, Urbana, Ill. Price, 75 cents.

RATING AND TESTING AIR CONDITIONERS—Standard 16-53 has been issued by the American Society of Refrigerating Engineers to supersede ASRE Standards 13, 16 and 16R. The new standard covers methods of rating and testing air conditioners, including the cooling and heating and other functions of self-contained air conditioners, room air conditioners, remote-type air conditioners, heat pumps, and oil and gas-fired air conditioners. The latest revision affects primarily the room air conditioner portion of the standard. American Society of Refrigerating Engineers, 234 Fifth Ave., New York 1, N. Y. Price, $1.

TECHNOLOGY AND ECONOMICS OF WATER SUPPLY—A survey was conducted to explore the possibilities of research in the field of water supply. It has greater emphasis than usual on the economics of water. In the belief that others may be interested in this study, the report has been made available to others. The report covers the hydrologic cycle, manufacture of fresh water from sea water, methods for increasing supplies of water. Report R-258-RC, a Brief Survey of the Technology and Economics of Water Supply. The Rand Corp., 1700 Main St., Santa Monica, Calif.

TRAPPING SOLAR ENERGY—The September, 1953 issue of The Ohio Journal of Science contains papers presented at a symposium of the Ohio Academy of Science on The Trapping of Solar Energy. Topics covered are solar radiation, heating of air by solar energy, photosynthesis, the utilization of solar energy through photochemical reactions, photovoltaic cells and their possible use as power converters for solar energy, and the use of optical systems in the utilization of solar energy. The Ohio Journal of Science, The Ohio State University, Columbus 10, Ohio.

EDGE INSULATION AND CONCRETE SLAB FLOORS—As a result of a study conducted by the National Bureau of Standards, a report has been issued on Effect of Edge Insulation Upon Temperature and Condensation on Concrete Slab Floors. It is Building Materials and Structures Report 138. Condensation, which probably would occur on uninsulated floors under certain conditions, can be prevented by the use of edge insulation. Report contains recommendations concerning types and arrangements of edge insulation. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 20 cents.



AVAILABLE RIGIDBILT PRODUCTS

CEILING TYPE AIR CONDITIONING UNITS	STANDARD STEAM HEATING COILS
FLOOR TYPE AIR CONDITIONING UNITS	STEAM DISTRIBUTING TUBE HEATING COILS
VENTILATING UNITS	HOT WATER HEATING COILS
DIRECT EXPANSION COOLING COILS	SUSPENDED TYPE UNIT COOLERS FOR ALL REFRIGERANTS
WATER COOLING COILS	FLOOR TYPE PRODUCT COOLERS

SPECIAL COILS FOR ALL REFRIGERANTS
DESIGNED TO MEET THE MOST EXACTING REQUIREMENTS

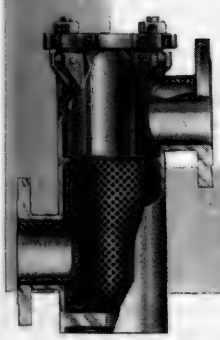
RIGIDBILT IS BETTER BUILT—Write for Catalog.

RIGIDBILT INC.

FULTON AND FRANCISCO CHICAGO 12, ILLINOIS

Floor Type Product Cooler
FOR FULL-FLOODED AMMONIA.
Units of this type for *all* refrigerants and applications.

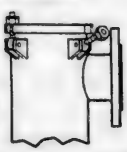
USE ADSCO



S-Type ADSCO Strainers screen out foreign matter from oil, water, and other liquid lines. Damage to valuable equipment is prevented. Usually installed on suction side but can also be used for discharge or other services.

S-TYPE

STYLE B COVER
Toggle and Bolt Type



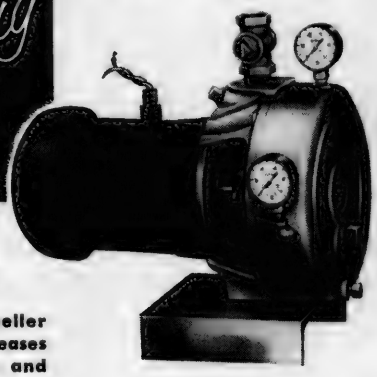
Cover held in place by toggle bolts. This design simplifies removal of cover while cleaning basket screen. In sizes from 4" to 12", for pressures to 50 psi.

STRAINERS

AMERICAN DISTRICT STEAM COMPANY, INC.
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y., AND RICHMOND, CALIF.

Especially Designed for *Air Conditioning Use!*

BURKS® IHV PUMPS



with patented
"Kam-Action"®

. . . the exclusive impeller volute design which increases efficiency, performance and capacity!

- Can be installed horizontally or vertically—without mechanical changes.
- Full length stainless steel shaft assures perfect alignment of motor, shaft and impeller.
- Balanced bronze impeller for smoother, quieter operation.
- There's an IHV Pump for your exact need—¼ hp through 5 hp—heads to 190 feet—capacity up to 110 gallons per minute.
- Equipped with supply and discharge pressure gauges, and control valve for adjusting to the most efficient pressure for each individual installation.

BURKS PUMPS

Write today for full details.
DECATUR PUMP COMPANY
75 Elk Street, Decatur, Illinois

O.K.
to Re-order
For Commercial, Industrial and Institutional Installations
Sizes 1 to 60 gph capacity. Only oil burner designed especially to burn No. 5 oil without preheating. Gas, combination gas/oil burners also available.

Fuel savings up to 30% make HEV-E-OIL Burner *best buy* for you!

No wonder HEV-E-OIL Burner customers are *repeat* buyers! Hundreds of commercial and industrial buyers say HEV-E-OIL Burners helped them save up to 30% on fuel costs by *burning thrifty heavy oils.* Here's what typical owners* say:

"— since installing your HEV-E-OIL burners, we have been using the No. 5 grade oil, this has saved us approximately $900.00."

"— we formerly used 30,000 gallons of light oil per year. Now, with Cleaver-Brooks HEV-E-OIL Burners, we only consume 25,000 gallons of No. 5 oil, which gives us a saving of $700.00 per year."

*Names on request

Here's how to get started cutting heating bills 30%

1 Add up your present heating bills — then deduct 30%. This is your approximate saving with HEV-E-OIL Burner.

2 Write for Bulletin AD-102— highly illustrated, with more fact-packed reasons why it will pay you to convert to HEV-E-OIL.

3 Get in touch with your Cleaver-Brooks HEV-E-OIL dealer — he will be glad to make a free survey without obligation.

REMEMBER . . . if you are using 6,000 gals of oil, or more than 45 tons of coal per year — the HEV-E-OIL Burner is the *best buy* for you! Write direct for name of dealer nearest you.

HEV-E-OIL Burner installed at Bay Shore Lutheran Church, Milwaukee, Wis.

Cleaver-Brooks

BURNER DIVISION • CLEAVER-BROOKS COMPANY

Dept. F, 382 E. Keefe Ave., Milwaukee 12, Wisconsin

MORE ABOUT RELIEF VALVES

(*Concluded from page 96*)

"'*In an assembly of three-step type relief valves, the relief valve of the lowest setting (30 pounds) would have relieved the immediate pressure of this installation.*' Although step type relief valves are permissible under the ASME low pressure heating boiler code (paragraph H44-E-F-G), they are, nevertheless, only one alternative means of compliance with the primary intent of the code to limit pressure to the maximum allowable working pressure of the boiler (paragraph H44-A).

"An alternative provision was made whereby rupture discs, steam pop safety valves, and other similar devices could be used to augment the primary relief valve in order to make up the emergency capacity requirements. Since steam pop safety valves do not always seat tightly after water relief, they were permitted to be set at higher pressures than the primary relief valves so that they would function only at extreme emergency conditions. Step type relief valves are a substitute for a single boiler safety relief valve specifically engineered to do the job.

"In our opinion the present trend toward relief valves in larger sizes is logical since they are safe and inexpensive as well as neat. All in all, engineers, contractors and others can specify the larger ASME relief valves with confidence."

Canadian Degree-Days for March, 1954

City	March		Cumulative	
	1954	Normal	1954	Normal
Calgary, Alta.	1376	1215	8541	7881
Charlottetown, P.E.I.	1147	1203	6181	6869
Crescent Valley, B. C.	1011	961	6226	6704
Edmonton, Alta	1327	1290	8068	8589
Fort William, Ont.	1408	1386	8277	8590
Grande Prairie, Alta.	1538	1339	9083	8795
Halifax, N. S.	1000	1066	5257	6134
London, Ont.	1128	1073	5955	6326
Medicine Hat, Alta.	1339	1150	7143	7588
Moncton, N. B.	1157	1190	6448	7296
Montreal, P. Q.	1163	1265	6628	7373
North Bay, Ont.	1358	1280	7642	7933
Ottawa, Ont.	1224	1256	6916	7638
Penticton, B. C.	890	787	5263	5566
Porquis Junction, Ont.	1631	1550	9023	9614
Prince George, B. C.	1252	1091	7554	7768
Quebec City, P. Q.	1280	1311	7144	7999
Regina, Sask.	1455	1504	8311	9641
St. John, N. B.	1138	1132	6296	6784
Saskatoon, Sask.	1556	1445	8652	9356
Toronto, Ont.	1029	1072	5411	6226
Vancouver, B. C.	766	682	4330	4479
Victoria, B. C.	725	651	4073	4065
Windsor, Ont.	1017	995	5234	5872
Winnipeg, Man.	1475	1531	8488	9622

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

The department reports slight revisions in the figures for February, as published in last month's issue. Corrected figures are: London Ont., 980; Medicine Hat, Alta., 868; Saskatoon, Sask., 1218.

• ARE YOU INTERESTED IN PERIMETER HEATING?

A-J

This diffusing type floor register was carefully engineered, in cooperation with heating specialists, to provide the answer for a perfect outlet for perimeter heat!

It's ruggedly constructed. The heavy gauge curved vanes are factory-set to deliver a uniform fan-shapped pattern of air to cover the window areas or cold outer walls.

The 4" and 6" widths have multiple louvers. The 2¼" width has a single louver, embossed for greater rigidity. A special lock screw allows you to set the valve louvers so they cannot be opened beyond the desired position after system is balanced. Louvers close tightly to completely shut off air flow when desired.

YOU'LL USE IT MANY PLACES!

The narrow width of this register makes it ideal for numerous installations other than perimeter heating. For instance: In stair risers, under kitchen cabinets, in sills of picture windows. It may also be used as a side wall outlet with high velocity systems. It is vibration-free!

Write for our Complete
FREE CATALOG
Listing Over 1000 Types and Sizes of Grilles and Registers for Every Need!

Here's a New Diffuser REGISTER . . .

. . . Designed Especially for This Type System!

AVAILABLE IN SEVEN SIZES!

14 x 2¼	10 x 4	12 x 4	14 x 4
10 x 6	12 x 6	14 x 6	

CHOICE OF FINISHES

A-J Perimeter Registers may be ordered in any of these finishes: Gray prime, Gray Hammertone, Bronze Hammertone, Black Japan, Golden Oak or White Japan.

A-J MFG. CO. DEPT. V5 2119 WASHINGTON ST. KANSAS CITY, MO.

Air Cooling COILS

2 to 15 Ton CAPACITY

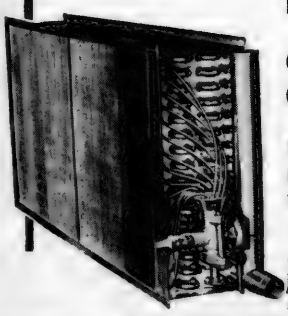
NEW Complete Line

REMPE

COMPLETE WITH MULTI-OUTLET EXPANSION VALVES MADE-ON— READY TO INSTALL

4 Row Coils for Residential Jobs.

6 Row Coils for Commercial Jobs.



Precision built to insure top performance and to give trouble-free service.

Write for bulletin and prices.

Complete facilities for fabrication of pipe coils—all types—all materials. Engineering service. Send details for price.

HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890

REMPE COMPANY

358 N. Sacramento Blvd., Chicago 12, Ill.

NEW Aerovent Portable Utility FANS

for product and personnel cooling • drying, exhausting and ventilating

Full 180° high-velocity air discharge. Mounts on ceilings, walls or floors. Heavy-duty rolled steel construction with expanded metal guards. Meets all safety standards. Available in sizes 16" to 36" for capacities to 20450 CFM

other models for every air-moving requirement

Certified Ratings

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Ask for free folder P-50!

Aerovent Fan Company, Inc.

Ash and Brandt Streets Piqua, Ohio

Shed those design shackles, specify

AGITAIR

You can give free rein to your creative planning and still rely on AGITAIR square and rectangular diffusers to provide draftless air distribution from any location. Custom-designed, with built-in diffusing vanes, in a wide variety of louvered patterns, they provide blows in 1, 2, 3 or 4 directions without use of blank-offs. AGITAIR diffusers need not be centrally located in an area if such placing does not agree with the decorative motif, or if a beam or other obstruction is in the way.

Moreover, AGITAIR square and rectangular diffusers are now available with or without removable, interchangeable cores. AGITAIR also brings you Stripline, the slender, continuous air diffuser with unlimited application versatility.

New 34-page Type R Catalog reveals how correct air distribution is simplified by AGITAIR. Contact your local AGITAIR representative, or write us direct for your free copy.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

DEGREE-DAYS FOR MARCH, 1954

(A) Airport readings; (C) city office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 26th Year of Publication of Monthly Degree-Day Data

City	March 1954	March 1953	Normal
Abilene, Texas (A)	343	162	344
Albany, New York (A)	941	869	989
Albuquerque, New Mexico (A)	581	500	589
Alpena, Michigan (C)	1180	1066	1156
Anaconda, Montana (C)	1202	952	1081*
Asheville, North Carolina (C)	596	483	572
Atlanta, Georgia (A)	(a)	319	404
Atlantic City, New Jersey (C)	706	616	729
Augusta, Georgia (A)	337	254	308
Baltimore, Maryland (C)	601	558	611
Billings, Montana (A)	1162	819	958
Binghamton, New York (C)	1090	795	927
Birmingham, Alabama (A)	383	236	378
Bismarck, North Dakota (A)	1268	1189	1187
Block Island, Rhode Island (A)	817	784	865
Boise, Idaho (A)	791	695	719
Boston, Massachusetts (A)	806	799	849
Bozeman, Montana (C)	1204	904	1096*
Buffalo, New York (A)	988	876	992*
Burlington, Iowa (A)	903	808	822
Burlington, Vermont (A)	1088	952	1107
Butte, Montana (C)	1209	977	1048*
Cairo, Illinois (C)	531	382	523
Charleston, South Carolina (C)	279	157	260
Charlotte, North Carolina (A)	471	376	449
Chattanooga, Tennessee (A)	464	360	467
Cheyenne, Wyoming (A)	1148	855	1029
Chicago, Illinois (C)	914	783	845*
Cincinnati, Ohio (C)	691	540	645
Cleveland, Ohio (A)	920	765	874
Columbia, Missouri (A)	732	595	698
Columbia, South Carolina (C)	329	249	318
Columbus, Ohio (C)	798	676	741
Concord, New Hampshire (A)	994	914	1029
Concordia, Kansas (C)	811	605	725
Dallas, Texas (A)	315	128	288
Dayton, Ohio (A)	630	702	781
Deer Lodge, Montana (C)	1114	882	1056*
Denver, Colorado (A)	912	656	843
Des Moines, Iowa (A)	980	828	868
Detroit, Michigan (A)	970	834	927
Devils Lake, North Dakota (C)	1311	1246	1314
Dodge City, Kansas (A)	761	529	694
Dubuque, Iowa (A)	1054	955	983
Duluth, Minnesota (C)	1310	1184	1252
Eastport, Maine (C)	(a)	1006	1063
Elkins, West Virginia (A)	837	749	797
El Paso, Texas (A)	316	211	330
Ely, Nevada (A)	1024	920	921
Erie, Pennsylvania (C)	(a)	799	911
Escanaba, Michigan (C)	1203	1086	1203
Evansville, Indiana (A)	655	525	589
Fargo, North Dakota (A)	1219	1139	1231
Fort Smith, Arkansas (A)	476	295	418
Fort Wayne, Indiana (A)	925	805	874
Fort Worth, Texas (A)	324	133	308
Fresno, California (A)	301	355	304
Galveston, Texas (C)	186	32	176
Grand Junction, Colorado (A)	766	674	738
Grand Rapids, Michigan (A)	1046	888	1008
Green Bay, Wisconsin (A)	1110	1049	1132
Greensboro, North Carolina (A)	541	482	528
Greenville, South Carolina (A)	439	347	442
Harrisburg, Pennsylvania (A)	758	678	750
Hartford, Connecticut (A)	802	776	871
Hatteras, North Carolina (C)	361	314	394
Havre, Montana (C)	1269	951	1076
Helena, Montana (A)	1160	904	1017
Houston, Texas (C)	187	23	166
Huron, South Dakota (A)	1156	1012	1032
Indianapolis, Indiana (A)	842	703	772
Jackson, Mississippi (A)	311	126	299
Kansas City, Missouri (A)	717	579	666
Knoxville, Tennessee (A)	511	389	500
La Crosse, Wisconsin (A)	1071	990	1035
Lander, Wyoming (A)	1180	930	1045
Lansing, Michigan (A)	1056	891	986
Lewiston, Maine (O)	1004	909	1093*
Lincoln, Nebraska (C)	901	694	794
Little Rock, Arkansas (A)	395	254	401

City	March		
	1954	1953	Normal
Livingston, Montana (C)	1178	850	967*
Los Angeles, California (C)	242	194	212
Louisville, Kentucky (A)	650	529	611
Lynchburg, Virginia (A)	601	545	584
Macon, Georgia (A)	291	201	275
Madison, Wisconsin (C)	1034	949	1011
Marquette, Michigan (C)	1191	1066	1181
Memphis, Tennessee (A)	423	268	427
Meridian, Mississippi (A)	324	166	309
Milwaukee, Wisconsin (A)	1028	922	983
Minneapolis, Minnesota (A)	1145	1042	1057
Moline, Illinois (A)	953	850	862
Montgomery, Alabama (A)	307	158	288
Nantucket, Massachusetts (A)	849	833	880
Nashville, Tennessee (A)	512	367	498
New Haven, Connecticut (A)	820	796	865
New Orleans, Louisiana (C)	190	22	163
New York, New York (C)	729	665	753
Newark, New Jersey (A)	728	680	760
Norfolk, Virginia (A)	499	386	500
North Head, Washington (C)	(a)	594	598
North Platte, Nebraska (A)	1007	760	887
Oak Ridge, Tennesee (C)	533	439	(a)
Oakland, California (A)	422	383	360
Oklahoma City, Oklahoma (C)	524	302	472
Omaha, Nebraska (A)	920	752	831
Parkersburg, West Virginia (C)	729	604	672
Peoria, Illinois (A)	910	773	828
Philadelphia, Pennsylvania (C)	671	592	667
Phoenix, Arizona (A)	206	102	175
Pittsburgh, Pennsylvania (C)	782	659	735
Pittsfield, Massachusetts (A)	1024	952	1060
Pocatello, Idaho (A)	954	815	880
Portland, Maine (A)	1026	940	1039
Portland, Oregon (C)	594	543	515
Providence, Rhode Island (A)	828	748	874
Pueblo, Colorado (A)	818	621	775
Raleigh, North Carolina (C)	478	392	440
Rapid City, South Dakota (A)	1150	872	1045
Reading, Pennsylvania (C)	722	645	725
Red Bluff, California (A)	424	348	336
Reno, Nevada (A)	(a)	579	753
Richmond, Va. (A)	551	485	550
Rochester, New York (A)	1013	865	992
Roswell, New Mexico (A)	418	299	443
Sacramento, California (C)	404	334	317
St. Joseph, Missouri (A)	793	679	648
St. Louis, Missouri (C)	670	513	620
Salt Lake City, Utah (A)	813	664	741
San Antonio, Texas (A)	194	46	190
San Diego, California (A)	234	224	223
Sandusky, Ohio (C)	884	738	853
San Francisco, California (C)	396	361	317
Sault Ste. Marie, Michigan (A)	1335	1164	1302
Savannah, Georgia (A)	272	135	238
Scranton, Pennsylvania (C)	865	780	859
Seattle, Washington (C)	626	578	558
Sheridan, Wyoming (A)	1182	854	1035
Shreveport, Louisiana (A)	293	110	272
Sioux City, Iowa (A)	1047	856	930
Spokane, Washington (A)	882	765	834
Springfield, Illinois (C)	791	644	713
Springfield, Missouri (A)	672	488	632
Syracuse, New York (A)	975	866	955
Tacoma, Washington (C)	(a)	616	595
Terre Haute, Indiana (A)	808	672	725
Toledo, Ohio (A)	950	790	905
Topeka, Kansas (C)	735	585	669
Trenton, New Jersey (C)	719	655	735
Tulsa, Oklahoma (A)	520	328	485
Utica, New York (O)	1037	1137	989*
Valentine, Nebraska (C)	1127	867	970
Walla Walla, Washington (C)	686	523	564
Washington, D. C. (C)	621	539	606
Wichita, Kansas (A)	687	481	619
Williston, North Dakota (C)	1309	1137	1194
Winnemucca, Nevada (A)	910	799	794
Yakima, Washington (A)	789	666	660

(a) Data not available

*Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

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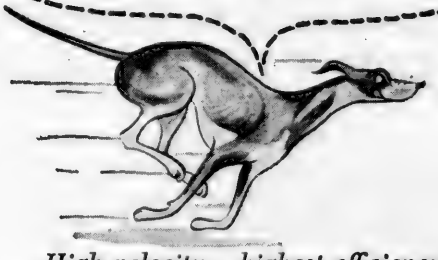

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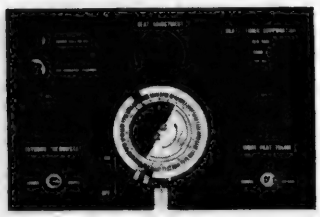

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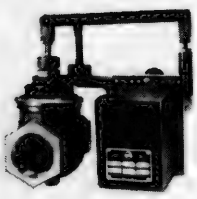

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Where listed, names or titles of individuals are those from whom further information is available.

New Exposition Building for New York

The $30 million New York Coliseum, shown above, is expected to be finished by March, 1956. The building consists basically of a four-level exhibition hall containing over nine acres of floor area for exposition purposes.

PROFESSIONAL ENGINEERS CONVENTION—28th annual convention and engineering industries Exposition of the New York State Society of Professional Engineers, at the Commodore Hotel, New York, N. Y. Herald Beckjorden, executive secretary of the Society, 1941 Grand Central Terminal, New York 17, N. Y. . . . . **MAY 6-8, 1954.**

LP GAS CONVENTION—National convention of the Liquefied Petroleum Gas Association at the Conrad Hilton Hotel, Chicago, Ill. Robert E. Borden, director of publicity and advertising for the Association, 11 So. La Salle St., Chicago 3, Ill. . . . . **MAY 9-12, 1954.**

CHEMICAL ENGINEERS MEETING—Springfield national meeting of the American Institute of Chemical Engineers, at the Hotel Kimball, Springfield, Mass. S. L. Tyler, executive secretary of the Institute, 120 E. 41st St., New York 17, N. Y. . . . . **MAY 16-19, 1954.**

INDOOR COMFORT EXPOSITION—The National Indoor Comfort Exposition, at the Commercial Museum, Philadelphia, Pa., in conjunction with the 32nd Convention of the Oil-Heat Institute of America, Inc. R. H. L. Becker, secretary of the Institute, 500 Fifth Ave., New York 36, N. Y. . . . . **MAY 16-20, 1954.**

OHI OLD TIMERS MEETING—Annual meeting and dinner party of the Old Timers Club of the Oil Burner Industry, Inc., at the Philadelphia Rifle Club, 7th and Tabor Rd., Philadelphia, Pa., during the week of the National Indoor Comfort Exposition. H. A. Maccubbin, national secretary, 120 W. Madison St., Villa Park, Ill. . . . . **MAY 18, 1954**

GAS APPLIANCE MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Drake Hotel, Chicago, Ill. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **MAY 19-21, 1954.**

STEEL BOILER MEETING—Annual meeting of the Steel Boiler Institute, at The Traymore Hotel, Atlantic City, N. J. Secretary of the Institute, Land Title Building, Philadelphia 10, Pa. . . . . **MAY 24-25, 1954.**

HEATING AND PIPING CONTRACTORS CONVENTION—65th annual convention of the Heating, Piping and Air Conditioning Contractors National Association, at the Hotel Traymore, Atlantic City, N. J. Lloyd B. Gruman, Jr., acting secretary of the Association, 1250 Avenue of the Americas, New York 20, N. Y. . . . . **MAY 24-28, 1954.**

NDHA CONVENTION—Annual convention of the National District Heating Association, at The Greenbrier, White Sulphur Springs, West Va. John F. Collins, Jr., secretary of the Association, 827 N. West Euclid Ave., Pittsburgh 6, Pa. . . . . **MAY 25-28, 1954.**

IBR MEETING—Meeting of the Institute of Boiler & Radiator Manufacturers, at Seaview Country Club, Absecon, N. J. Secretary of the Institute, 60 E. 42nd St., New York, N. Y. . . . . **JUNE 2-4, 1954.**

(*Concluded on page* 164)

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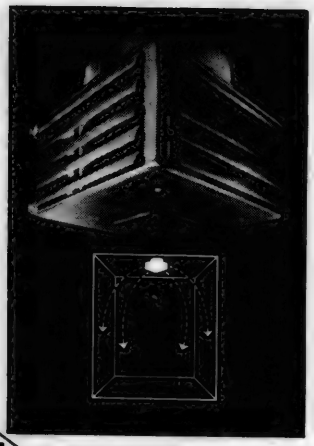

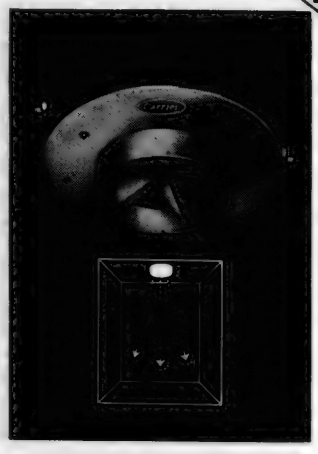

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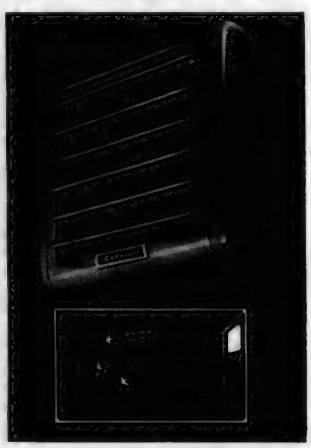

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(*Concluded from page* 162)

AUTOMOTIVE ENGINEERS MEETING—Summer meeting of the Society of Automotive Engineers, at the Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J. Secretary of the Society, 29 W. 39th St., New York 18, N. Y. . . **JUNE 6-11, 1954.**

TESTING MATERIALS MEETING—Annual meeting and exhibition of the American Society for Testing Materials, at the Sherman Hotel, Chicago, Ill. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 13-18, 1954.**

ENGINEERING EDUCATION MEETING—Annual meeting of the American Society for Engineering Education, at the University of Illinois, Urbana, Ill. Prof. A. W. Bronwell, secretary of the Society, Northwestern University, Evanston, Ill. . . . . **JUNE 14-18, 1954.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at the William Penn Hotel, Pittsburgh, Pa. Secretary of the Society, 29 W. 39th St., New York 18, N. Y. . . . . **JUNE 20-24, 1954.**

METEOROLOGICAL MEETING—129th National meeting of the American Meteorological Society, in Pullman, Wash. Kenneth C. Spengler, executive secretary of the Society, 3 Joy St., Boston 8, Mass. . . . . **JUNE 23-24, 1954.**

ASHVE MEETING—60th semi-annual meeting of The American Society of Heating and Ventilating Engineers, at the New Ocean House, Swampscott, Mass. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 28-30, 1954.**

REFRIGERATING ENGINEERS MEETING—41st semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Olympic, Seattle, Wash. Julia I. Szabo, secretary of the Society, 234 Fifth Avenue, New York City. . . . . **JULY 11-14, 1954.**

PLANT MAINTENANCE SHOW—Western Plant Maintenance Show at the Pan Pacific Auditorium, Los Angeles, Calif. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. . . . . **JULY, 13-15, 1954**

SANITARY ENGINEERS MEETING—48th annual meeting of the American Society of Sanitary Engineering, at the Muehlebach Hotel, Kansas City, Mo. Walter A. Dunn, secretary of the Society, 4716 Ewins Ave. S., Minneapolis, Minn. . . . . **AUGUST 8-12, 1954.**

CHEMICAL SOCIETY MEETING—126th national fall meeting of the American Chemical Society, in New York City. R. M. Warren, secretary of the Society, 1155 Sixteenth St. N.W., Wash. 6, D. C. . . . . **SEPTEMBER 12-17, 1954.**

INTERNATIONAL INSTRUMENT CONGRESS—First International Instrument Congress and Exposition, sponsored by The Instrument Society of America, to be held in the Commercial Museum and Convention Hall, Philadelphia, Pa. Richard Rimbach, managing director of the Exposition, 845 Ridge Ave., Pittsburgh 12, Pa. . . . . **SEPTEMBER 13-25, 1954.**

ELECTRICAL ENGINEERS MEETING—Fall general meeting of the American Institute of Electrical Engineers, at the Hotel Morrison, Chicago, Ill. Secretary of the Institute, 33 West 39th St., New York 18, N. Y. . . . . **OCTOBER 11-15, 1954.**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at the Statler Hotel, New York City. Secretary of the Society, 29 W. 39th St., New York City. . . . . **NOVEMBER 28-DECEMBER 3, 1954.**

POWER SHOW—21st National Exposition of Power and Mechanical Engineering, at the Comercial Museum, Philadelphia, Pa., to be held under the auspices of The American Society of Mechanical Engineers. Charles F. Roth, manager of the Exposition, 480 Lexington Ave., New York 17, N. Y. . . . . **DECEMBER 2-7, 1954.**

STORE MODERNIZATION SHOW—1st National Retail Industry Show of the Store Modernization Institute, at Madison Square Garden, New York City. Secretary of the Institute, 20 East 55th St., New York City. . . . . **JANUARY 7-11, 1955.**

HEATING & VENTILATING EXPOSITION—12th International Heating & Ventilating Exposition, at the Commercial Museum and Convention Hall, Philadelphia, Pa., held under the auspices of the American Society of Heating and Ventilating Engineers. Charles F. Roth, manager of the Exposition, 480 Lexington Ave., New York 17, N. Y. . . . . **JANUARY 24-28, 1955.**

LUBRICATION ENGINEERS MEETING—Annual meeting and exhibit of the American Society of Lubrication Engineers, at the Hotel Sherman, Chicago, Ill. Wm. P. Youngclaus, Jr., secretary of the Society, 84 E. Randolph St., Chicago 1, Ill. . . . . **APRIL 13-15, 1955.**

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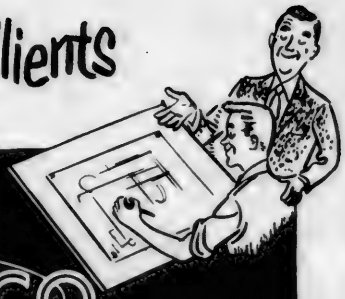

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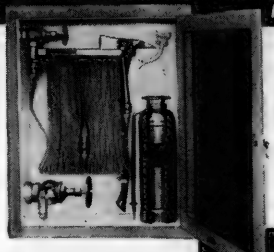

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ESTIMATING WEIGHT OF METAL IN RECTANGULAR DUCTS

The accompanying table and subsequent tabulations are for determining the weight of galvanized steel required for rectangular ducts. The weights are based on commonly used standards, and include allowance for seams, on the assumption that ducts are cut from 30 in. wide sheets, and that one lap of 1 in. is required for each sheet. Thus, ducts up to 29 in. perimeter allow 1 in. lap; from 30 in. to 59 in., 2 in. lap, and so on up to a 60 in. × 60 in. duct which has an allowance for 9 in. lap. No allowance is made for waste, bracing, or hanging.

The inclined line divides the tables into two parts. Weights for sizes found to the left and below the diagonal line are in the bottom lines, while the weights in the top lines are for sizes to the right of and above the diagonal. The figures are so arranged that all ducts having the same perimeter appear in the same vertical column and, therefore, have the same weight and area of surface.

Example. Find the weight of 26-gage galvanized steel in a 4 in. × 10 in. duct 45 ft. long. Also find the area to be covered by insulation.

Solution. In the first and last vertical columns of the table covering 1 × 1 to 15 × 15 inch ducts, find the dimensions of one side (either side) of the duct. Opposite 4 in the first column move horizontally to the figure 10, which is to the *right* of the diagonal, so that the results are to be found at the *top* of the chart. Following upward from the 10 find that the duct has a surface area of 2.33 sq. ft. per lineal foot. In the first and last vertical columns find the gages of the sheet metal and find opposite 26 and above the 10 that 2.18 lb. of metal is required per foot of duct. If 22-gage metal has been used, 3.38 lb. per ft. would have been needed.

By calculation the weight of the duct is 45 × 2.18 or 98.1 lb., and the surface area is 45 × 2.33 or 104.9 sq. ft.

To determine weights of ducts made of galvanized steel heavier than 16 gage or lighter than 26 gage, use the following method: For the heavier gages, follow the usual procedure and find the weight of metal required for a 16-gage duct. Multiply the result by 1.22 to obtain the weight of a 14-gage duct, and by 1.67 to obtain the weight of a 12-gage duct. For the lighter gages, follow the usual procedure and find the weight of a 26-gage duct, and multiply the result by 0.78 for a 28-gage and by 0.73 for a 30-gage duct.

Recommended gages of galvanized steel sheets for various size rectangular ducts for heating and air conditioning work are:

Greatest Dimension of Duct, Inches	Gage
Up to 12	26
13 to 30	24
31 to 60	22
61 to 90	20
Over 90	18

For industrial exhaust ventilation, the following gages represent good practice:

Greatest Dimension of Duct, Inches	Gage
Up to 8	24
9 to 15	22
16 to 22	20
23 to 30	18
Over 30	16

Material for Rectangular Elbows. The following formula is useful for determining the weight of metal in an elbow

$$A = \pi R(D + W)$$

where A = area of metal in square feet, not including allowances for seams and flanges, R = radius of center line of duct in feet, D = depth of duct in feet, and W = width of duct in feet. The surface area multiplied by the weight per square foot in the following table gives the weight of metal:

Gage	Weight, Lb. per Sq. Ft.
16	2.7
18	2.2
20	1.7
22	1.4
24	1.2
26	0.9

The length of the total seam at the four edges is $2\pi R$, or $\pi(R_i + R_o)$ where R = radius of center line in feet, R_i = inside radius, feet, R_o = outside radius, feet.

The total length in feet of standing flange at the ends of the elbow = $4(D + W)$, where D (depth) and W (width) are in feet.

WEIGHTS OF GALVANIZED STEEL DUCTS—1 × 1 TO 15 × 15 IN.

Gage	Weight of Galvanized Steel Duct per Lineal Foot																Gage
16		1.13	1.57	2.03	2.48	2.93	3.38	3.83	4.28	4.73	5.18	5.63	6.08	6.53	7.20	7.65	16
18		.92	1.28	1.65	2.02	2.38	2.75	3.12	3.48	3.85	4.22	4.58	4.95	5.32	5.87	6.23	18
20		.71	.99	1.28	1.56	1.84	2.13	2.41	2.69	2.98	3.26	3.54	3.83	4.11	4.53	4.82	20
22		.59	.82	1.05	1.29	1.52	1.75	1.99	2.22	2.45	2.68	2.92	3.15	3.38	3.73	3.96	22
24		.50	.70	.90	1.10	1.30	1.50	1.70	1.90	2.10	2.30	2.50	2.70	2.90	3.20	3.40	24
26		.38	.52	.68	.83	.97	1.13	1.28	1.42	1.58	1.73	1.87	2.03	2.18	2.40	2.54	26

Width of Duct, Inches	Square Feet of Duct Surface per Lineal Foot of Duct																Width of Duct, Inches
	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50	2.67		
	Height of Duct, Inches																
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		1
2	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14		2
3	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13		3
4	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12		4
5	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11		5
6	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10		6
7	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9		7
8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8		8
9	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7		9
10	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6		10
11	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5		11
12	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4		12
13	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3		13
14	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2		14
15	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1		15

Gage	Square Feet of Duct Surface per Lineal Foot of Duct													Gage
	2.83	3.00	3.17	3.33	3.50	3.67	3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00		
	Weight of Galvanized Steel Duct per Lineal Foot															
26	2.70	2.85	3.00	3.15	3.30	3.45	3.60	3.75	3.90	4.05	4.20	4.35	4.50	4.73		26
24	3.60	3.80	4.00	4.20	4.40	4.60	4.80	5.00	5.20	5.40	5.60	5.80	6.00	6.30		24
22	4.20	4.43	4.66	4.90	5.13	5.36	5.60	5.83	6.06	6.30	6.52	6.75	7.00	7.35		22
20	5.10	5.38	5.67	5.95	6.23	6.52	6.80	7.08	7.37	7.65	7.93	8.22	8.50	8.93		20
18	6.60	6.97	7.33	7.70	8.07	8.43	8.80	9.17	9.53	9.90	10.27	10.63	11.00	11.55		18
16	8.10	8.55	9.00	9.45	9.90	10.35	10.80	11.25	11.70	12.15	12.60	13.05	13.50	14.18		16

The Industry's confidence in Henry Products is reflected by the largest demand in the Company's production history over the past **40 years**

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Valves, Driers and Strainers

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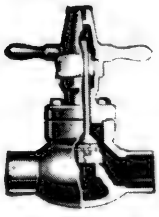
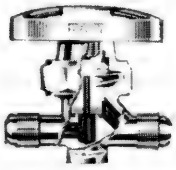
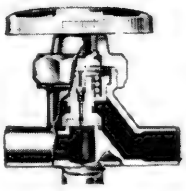


Wing Cap Valve

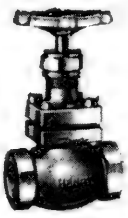


Packless Valve With Balanced-Action Blue Bantam Type

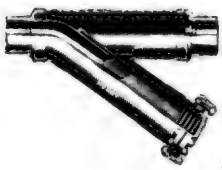


Packless Valve With Balanced-Action Standard Type

Drier



Ammonia Valve



"Y" Strainer

Angle Type Drier

Henry Valve Co.

Melrose Park, Illinois (Chicago Suburb)
Cable: Hevalco, Melrose Park, Illinois

HENRY VALVE CO. CONTROLLING FLOW SINCE 1914

Valves • Driers • Strainers • Control Devices and Accessories for Refrigeration • Air Conditioning and Industrial Applications

"You can't be safe by accident"

In the old days, when relief valves went by pipe sizes instead of discharge capacity, you might "accidentally" get a relief valve adequate for the job — particularly if you had an "open system."

But with the increase in the use of closed systems—and to prevent real accidents resulting in damaged boilers—the casualty companies, National Board, and others went to work . . . hence the present ASME Code calling for Btu.-rated relief valves.

It is no "accident" that McDonnell Relief Valves o the maximum safeguard against over-pressure for water space heating boilers, hot water tanks, and hea They were the first Btu.-rated valves . . . and they still first in design, workmanship, quality, and on-the dependability.

In the McDonnell 230 series you have a relief valve practically every job. Note the range of capacities sizes listed below.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

The accompanying table tells the story. For hot water space heating boilers the precision-built, dependable McDonnell 230 Series has been expanded to cover the large boilers as well as the small ones. In addition to the ¾" valve, the series now includes 1" and 1½" sizes for larger boilers. For still larger boilers there are the manifold assemblies—dual valves with a common inlet. These offer the very real advantage of *keeping discharge in step with actual need* . . . a smaller valve, opening at 30 lbs., to take care of thermal expansion and a big valve, set at a slightly higher pressure, ready for any emergency.

For use on hot water tanks and heaters, McDonnell 230 Series Valves are available with standard opening pressures as listed and manifold assemblies are also available for large jobs.

All of these valves are designed and built to ASME requirements and have been tested, Btu.-rated, and certified by the National Board of Boiler and Pressure Vessel Inspectors.

For Hot Water Space Heating Boilers

Boiler Size Btu./hr.	McDonnell Valve No.	Opening Pressure	Outlet	Inl
303,000	230 ¾ Inch	30 lbs.	¾"	¾
743,400	230 1 Inch	30 lbs.	1"	1
1,025,100	230 1½ Inch	30 lbs.	1½"	1½
1,488,000	230 M-1 Includes 230 ¾ Inch	30 lbs.	¾"	2
	230 M36	36 lbs.	1½"	
1,928,400	230 M-2 Includes 230 1 Inch	30 lbs.	1"	2
	230 M36	36 lbs.	1½"	
2,150,400	230 M-3 Includes 230 1 Inch	30 lbs.	1"	2
	230 M45	45 lbs.	1½"	

For Hot Water Tanks and Heaters

Opening Pressure	McDonnell Valve No.	Capacity Btu./hr.	Outlet	Inl
75 lbs.	230-75	502,000	¾"	¾
100 lbs.	230-100	640,000	¾"	¾
125 lbs.	230-125	783,000	¾"	¾
150 lbs.	230-150	925,000	¾"	¾

Your Jobber Stocks Them

McDONNELL

Boiler Safety Devices

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1,025,100	230 1½ Inch	30 lbs.	1½"	1½
1,488,000	230 M-1 Includes 230 ¾ Inch 230 M36	30 lbs. 36 lbs.	¾" 1½"	2
1,928,400	230 M-2 Includes 230 1 Inch 230 M36	30 lbs. 36 lbs.	1" 1½"	2
2,150,400	230 M-3 Includes 230 1 Inch 230 M45	30 lbs. 45 lbs.	1" 1½"	2

For Hot Water Tanks and Heaters

Opening Pressure	McDonnell Valve No.	Capacity Btu./hr.	Outlet	In
75 lbs.	230-75	502,000	¾"	¾
100 lbs.	230-100	640,000	¾"	¾
125 lbs.	230-125	783,000	¾"	¾
150 lbs.	230-150	925,000	¾"	¾

Your Jobber Stocks Them

McDONNELL

Safety Devices